TCS Advanced Reader Head

Installation and Operation Manual

v2.0

Revision History

Version	Date	Comments
1.0	8th May 2000	First release, for issue 1 Advanced Reader Heads (P/N ASL-ARH-*X*).
2.0	16th June 2000	Minor tidy-ups.
2.0	8th December 2000	Applies to issue 2 Advanced Reader Heads (P/N ASL-ARH-2-*X*).

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Part Information

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Version 2.0

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Table of Contents

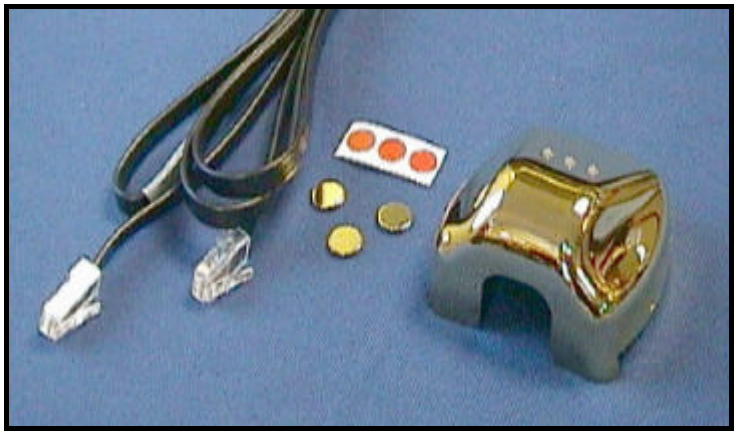
1. Getting Started

The Advanced Reader Head, ARH-2 ("ARH") from TCS reads the winning number from virtually all types of roulette wheels. It also senses when the game has started (i.e. the ball is spun in the rim of the roulette wheel) and signals to the graphical winning number display the "No More Bets" point which may be programmed to the precise point that the casino requires.

The Advanced Reader Head Kit consists of

- Reader Head (Part Number ASL-ARH-2-*X*, where *X* is the finish type).
- 3 steel discs (for magnetically fixing Reader Head to the wheel rim). These are normally supplied attached to the Reader Head in their usual locations (Part Number ASL-MAGDISK).
- 3 spare double-sided stickers (Part Number ASL-STICKYPAD).
- Reader Head Cable (Part Number ASL-CABLE-ARH2 / CBL-0024) labelled "ARH-2 CABLE".
- Self-adhesive black cable fixing clip.

ARH Cable, Self-Adhesive Steel Discs, Spare Stickers (for Discs) and Advanced Reader Head:



The Self-Adhesive Steel Discs are supplied magnetically fitted to the Reader Head:

NOTE: The Reader Head surface is finished using a high quality metal plating or painting process. Although the finish itself is robust, finger prints may spoil the gloss effect and therefore it is recommended that the Reader Head is handled using cotton gloves or a soft cotton cloth. Alternatively the Reader Head may be gently polished, again using a soft cloth, after fitting to the wheel.

2. Installation Procedure

2.1 Mount the Reader Head on the Wheel

The ARH is attached to the wheel using the supplied self-adhesive steel discs that locate with miniature magnets fitted in the base of the reader head. This allows the ARH to be easily removed and guarantees correct alignment on replacement. The discs use a special non-marking adhesive which may be removed and re-positioned without leaving any trace on the wheel. Please read all of this section before starting.

a) Decide on a suitable position on the wheel. Typically this would be at the opposite end to the cloth, but check with the casino management. The only requirement from the ARH is that **it should be placed approximately midway between two of the canoes**. This is so that the No More Bets ball sensor does not pick up reflections from the canoes.

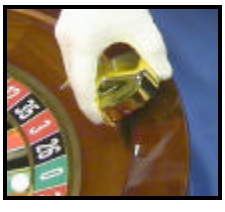
b) Clean the wheel at the chosen position using a clean dry cotton cloth.

c) Attach the magnetic discs to the ARH (if they are not already there) and carefully peel off the circular red plastic backing. (Hint: This is best done using a sharp knife in order to lift the edge of the backing material.)

d) Now offer the ARH up to the wheel, first placing the ARH's lip over the edge of the inside rim (see picture sequence below) and with gentle force towards the outside of the rim, place the ARH firmly down onto the wheel. It may now be lifted off to reveal the three steel discs stuck in the correct location. Press firmly on each disc in turn to ensure they have stuck to the wheel.

ARH with steel discs attached. One red backing peeled off and two to go:

Offer the ARH Up to the Rim and with pressure on the from lip, lower the back to stick on the wheel:

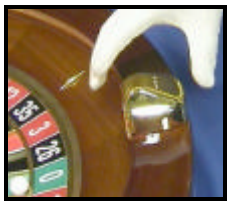


Step 1

Step 2

Step 3

Step 4



Step 5

NOTE: The ARH has been placed midway between two canoes.

Remove the ARH to Reveal the Steel Discs Stuck to the Wheel

Press firmly on each disc to ensure they have properly stuck down.

NOTE: In the event that the wheel needs to be rotated in a regular basis (as is the procedure in some casinos), the steel discs may be peeled off and re-stuck down in a different location. However if the discs have been stuck down for a while, new double-sided adhesive stickers may need to be used. Only the double-sided stickers as supplied by TCS should be used as these will not leave any trace or mark on the wheel.

2.2 Connect Up and Route the ARH Cable

Connect the ARH Cable to the Reader Head and route it via a cable clip at the base of the wheel back to the Control Box under the table, where it should be connected to the "Reader Head" socket. **IMPORTANT**: Make sure the correct cable is used – this is marked "ARH-2", and should only be used with ARH-2 Reader Heads (which have two adjustment holes at the back).

Reader Head Cable Routing:

The ARH is now installed and ready for calibration. The power can now be switched back on.

3. Calibration

3.1 Overview

For most wheels calibration simply requires the adjustment of two screws to align the light beams correctly onto the wheel. Some wheels, such as French roulette wheels, may require additional adjustments made inside the Reader Head, which involves removing the lid.

3.2 Standard Calibration – Adjusting the Light Beam Positions

This must be done for all installations and may be done without removing the lid from the ARH.

1. A long 2mm allen key can be inserted through one of two holes on the back of the ARH. This is included in the "ARH-2 Setup Kit".
2. Turning the allen key clockwise moves the light beam downwards; turning it anti-clockwise moves the beam upwards.
3. The hole to the right of the rear connector is used to adjust the number ring sensor light beams (the dual beam). This should be initially adjusted so that the beams are central in the number ring with a very slight bias towards the outer edge of the rim. If the wheel has large white numbers, depending on the wheel it is sometimes better to bias the sensors more towards the outside of the number ring (nearest the outer rim) to get maximum red and black area (as opposed to white numbers). The beam position can most easily be seen by aligning a red pocket in front of the beams, or by spinning the wheel quickly.
4. Similarly the hole to the left of the rear connector is used to adjust the white ball sensor light beam. This should be adjusted so that the beam is just above the centre on a ball of the same size as the one used during gaming. Note: If the casino uses different white balls on a regular basis it will not be possible to set the white ball sensor light beam to just above centre for every ball. In this instance the Reader Head may work best with the white ball beam set to the centre of the smallest white ball.

Adjusting the White Ball Beam:

3.3 Check Operation Having Aligned the Light Beams

Spin the wheel at a typical spin speed - the left hand LED ("WS" for Wheel Spin) should start to flash red for each red pocket detected. After two or three revolutions, this LED should go green indicating the Reader Head has synchronised to the wheel. Once synchronised, the LED will flash off for each pass of the single zero.

Now spin the white ball in the rim - the middle LED ("BR" for Ball in Rim) should flash for each rim pass of the white ball. On the first rim pass the Display should indicate "Good Luck" (if supported and enabled by the Display). When the ball slows down sufficiently to trigger the No More Bets (NMBs) point, the middle LED should remain on for several seconds and the Display should flash "No More Bets" (or "Last Bets" etc). The NMBs point may be adjusted using the Display to set a number between 1 and 20 (under SETUP-ADS-NMB, 1 is early and 20 late) - see also the "Manual Adjustments" section. Note that some displays do not support "Good Luck" or "No More Bets" graphics.

When the white ball lands in a pocket, the right hand LED ("WB" for White Ball) should flash for each pass of the white ball. The number of passes (1 or 2) before the winning number is sent may be set using the Display.

If Reader Head does not function correctly at this stage, it may need some manual adjustments which involves removing the lid as described in the next section.

3.4 Removing and Refitting the ARH Lid

Some calibration options require the lid to be removed. The lid is fixed using four grub screws around the lower part of the base. Two of these are either side of the RJ-45 connector, the other two are on the sides of the unit.

Removing the Lid:

1. Use a 1.27mm (0.050") allen key to screw in the four grub screws clockwise until they clear the lid. This is included in the "ARH-2 Setup Kit".
2. The lid can then be carefully lifted off..
3. To replace the lid, carefully align the lid with the base and push it down until the lower edge of the lid is flush with the bottom of the base.
4. Use the allen key to screw the four grub screws anti-clockwise until they are flush with the side of the lid.

3.5 French Roulette Wheels

Follow the previous steps described in this section first. If all is working well there is no need to do anymore. However, although the pocket sensing should work using the default settings, the white ball

sensitivity may need turning up: Remove the lid as described above. Locate the Mode Switch Bank - SW2 (contains 4 switches). Operate switch 4 to select the ON position (this selects a lower threshold for the white ball). Re-test the unit. If the white ball is still not detected, operate switch 3 to select the ON position (this increases the white ball sensor LED drive). Re-test the unit. If the white ball is still not being detected, set the threshold manually using the White Ball multi-turn trimmer: Spin the wheel with a white ball in a black pocket and gradually turn the 5 turn trimmer (using a 1.8mm screwdriver) clockwise until the LED next to it pulses on only when the white ball passes by. The unit should now function correctly.

3.6 Manual Level Adjustments

See "Appendix A: Internal Layout" for a picture showing the layout of the circuit board.

Trimmer	Function (Default as shipped is all trimmers fully anti-clockwise (auto-mode)
RB1	**Red/Black sensing manual adjustment**: If it is not possible to achieve synchronisation in the auto-mode, then spin the wheel quite fast and wind RB1 clockwise until the "WS" LED robustly goes and stays green. (The LED next to the RB1 trimmer should flash for each red pocket.) Note RB1 adjusts the threshold against an average background level - therefore the adjustment can only be made whilst spinning the wheel.
RB2	Reserved for future use.
WB	**White Ball detection threshold**: This may be used to manually set the threshold for the white ball detection. See Section 3.5 "French Roulette Wheels" for details of how to use. Generally this threshold is best set with the ball in a black pocket.
BR	**Ball in Rim manual adjustment**: In the unlikely circumstance that the white ball is not detected in the rim, this trimmer may be adjusted to set a lower threshold: Spin the ball in the rim and turn the trimmer slowly clockwise until the LED next to it flashes for each rim pass. This adjustment may also be used to raise the threshold should the middle ("BP") LED flicker due to noise pickup.

NOTE: The trimmers have 5 turns. When the trimmer is wound fully anti-clockwise, the Reader Head functions automatically for that particular adjustment. (Note there is no end stop - to wind fully anti-clockwise, simply turn more than 5 times anti-clockwise.) The default setting is fully anti-clockwise.

3.7 Setting the No More Bets Point

See section 5.

3.8 Additional Internal Settings

There are two more switches on the circuit board, SW2 and SW3. See "Appendix A: Internal Layout" for a picture showing the layout of the circuit board. SW3 should always be left in the default state with all switches set to off.

SW2 is also known as the “Mode Switch” and has the following functions:

Switch Element	Default Setting	Function
1	Off	When ON, allows the reader head to send the winning number without having first detected the ball in the rim. NOTE: The default setting means the reader head will NOT send the winning number unless the ball has been spun in the rim for several rim passes. This ensures no chance of repeated winning numbers. NOTE: If for any reason the reader head does not detect the ball in rim, then this switch must be set to on to allow numbers to be sent to the display
2	Off	Reserved for future use.
3	Off	When ON, gives increased brightness for the ball sensor light beam, which increases its sensitivity. Generally this should only be switched on for French wheels or sometimes for a small ball in a US wheel.
4	Off	When ON, selects a lower auto-threshold for the white ball detection.

3.9 Internal LEDs

With the lid removed, internal LEDs provide additional feedback on the operation of the unit. See “Appendix A: Internal Layout” for a picture showing the layout of the circuit board. When the unit is correctly calibrated the LEDs should behave as follows:

LED1 “RB1” and LED2 “RB2” (left hand side) is on whenever a red pocket is in front of the light sensor, and black for a black or green pocket. There is a slight time difference between the two LEDs, corresponding to the slightly different view the two light beams have. Note the sensors and LEDs RB1 abd RB2 will only operate correctly when the wheel is turning.

LED3 “WB” (also left hand side) is on whenever a ball is in the pocket in front of the sensor.

LED4 “BR” (also left hand side) shows green whenever a ball spinning in the rim of the wheel passes under the ARH.

LED5 “CW” (lower left of board) is on when the wheel is spinning clockwise, and off when it is spinning anti-clockwise.

LEDs 10, 11 and 12 are described in section 4.3.

LED13 “COMMS” (above the RJ-45 connector) blinks rapidly to show communication with the Control Box. This LED does not start flashing until communications have been established, which may take up to thirty seconds after the unit is powered up. This LED is visible from the rear of the unit even when the lid is fitted.

4. Normal Operation

4.1 Overview

Having calibrated the ARH, the wheel may be used as normal. There are no special procedures that the croupier must follow in order for the ARH to work correctly for normal roulette, apart from that the ARH must see at least one complete empty revolution between games (which should never be a problem).

This remainder of this section describes the functionality of the LEDs under normal operation. The LEDs are used as feedback that (a) the ARH is functioning correctly and (b) service staff may diagnose any problems quickly and efficiently. However it is not necessary to take any notice of the LEDs under normal gaming conditions. The LEDs are referred to as L1, L2 and L3 with L1 as the left LED, L2 as the middle and L3 as the right hand one, as viewed from the connector side of the ARH.

4.2 LEDs - Start Up Flash Sequence

Whenever the ARH is powered up or re-connected, the LEDs flash the following start up sequence:

1. All LEDs flash green, then off, and then red for about one second each.
2. The version number of the software is then flashed as a sequence of red flashes on L1 for the major revision number and L2 for the minor revision number, and L3 for the sub-minor revision number. For example software version v1.3 would result in L1 being flashed once, followed by L2 being flashed 3 times.

4.3 LEDs – Normal Operation

- When regaining synchronisation to the wheel, L1 flashes red for each red pocket.
- Once in sync, L1 goes solid green and flashes off for each pass of the single zero green pocket.
- L2 flashes once for each pass of the white ball when spinning in the rim. Solid green for about 6 seconds indicates the “No More Bets” (NMBs) point.
- L3 flashes for each pass of the white ball in a pocket.
- There is a small but finite probability that as the white falls into a pocket, it will bounce directly in front of the sensor and potentially cause it to lose synchronisation. This is not a problem, but may cause L1 to flash red again for one or two revolutions of the wheel. This mode is known as “Sync Recovery Mode” and is the only time when the winning number will be sent immediately following the Reader Head gaining synchronisation to the wheel.

5. Setting the No More Bets Point

The point at which "No More Bets" (NMBs) is sent to the graphical display may be set using the Keybox and menus, or via a 16 position rotary switch on the circuit board of the ARH. This allows the NMBs point to be adjusted to precisely the point at which the croupier would call "No More Bets". Alternatively it may be set earlier and the Graphical Display set to display "Last Bets" as a reminder to players to play their bets quickly.

When the ball is spun in the rim of the wheel, the middle LED (L2) flashes once for each pass. The NMBs point is indicated when this LED comes on and remains on. (This is the point the graphical display will indicate "No More Bets" if the setting is enabled.)

For a description of L2 in more detail refer to section 4.3.

5.1 Setting via the Menu

As default, the NMBs point can be set via the graphical display menu. To enable this mode, switch SW1 on the circuit board must be set to '0', which is the default setting as shipped.

In order to vary the setting, enter the menus on the graphical display by doing the following:

1. Via the Keybox, enter "Setup Mode" by pressing and holding the "Setup" button (right hand button) for 3 to 6 seconds. On entering Setup Mode, the display will read "SETUP" and display the version number of the graphical display. The version number should be v2.60 or greater.
2. Using the WHITE buttons (two right hand ones), highlight the "ADS" option. Then press the BLUE button to enter the ADS menu.
3. Again using the WHITE buttons, select NMB and press the BLUE button. The option will now read a number between 1 and 20.
4. To start with, set this number to 10 using the WHITE buttons to increment and decrement the number and then spin the ball in the rim and see when the NMBs point occurs. It is not necessary to exit the menus for the setting to take effect.
5. If a later NMBs point is desired then select a higher number, or if an earlier NMBs point is required then select a lower number.
6. All of the following steps are required to store the required value:
   a) Press the BLUE button to accept the new value.
   b) Press the RED button to return to the main menu.
   c) The menu is then exited by pressing and holding the RED button for several seconds (to switch the display "Off") and then pressing the BLUE button for several seconds to switch it back on into normal running mode.
   d) The graphical display system can now be powered down without loosing the new value.

NOTE 1: It is not necessary to spin the ball at high speed - the NMBs point is calculated from the slowdown rate of the last several revolutions. However it is necessary that the ball makes at least three passes under the ARH.

NOTE 2: Similarly the way in which the ball is spun (e.g. backspin, forward rolling spin etc) will not effect the accuracy of the NMBs point because the ARH recalculates the deceleration properties of the ball during each new game.

5.2 Setting using SW1

The internal 16 position switch marked “NMB Drop Point” may be used to set the No More Bets drop point manually.

1. Remove the ARH lid as described in section 3.3.
2. Use a small flat bladed screwdriver to adjust switch SW1 “NMB Drop Point” – see table below.
3. Replace the ARH lid as described in section 3.3.

Setting	Function (Default as shipped is setting 0 = read No More Bets drop point from Display)
0..F	In order to cope with Paltronics Displays prior to v2.60 (or alternative compatible displays), the No More Bets point may be manually adjusted: When the dialled up setting is 0, the No More Bets point is read from the Display. Alternatively a number between 1 and 15 (A = 10, B = 11 etc) may be dialled to set the No More Bets point directly. The lower the number the earlier the NMB point and vice-versa. **NOTE**: Paltronics displays (v2.60 and above) are shipped with the NMB setting set to 1. This is almost certainly far too low. Even if the No More Bets feature of the display is not being used, the NMB setting should still be set correctly – typically around 10.

6. Trouble Shooting

The ARH should work well on virtually all roulette wheels. However there are several potential pitfalls described here and some possible workarounds.

6.1 Synchronisation Problems

Synchronisation problems will be immediately obvious because L1 will not go green when the wheel is spun. Try the following solutions:

1. Vary the position of the dual red/black sensor beam. For example try biasing the beam nearer the edge or the centre of the numbered ring.
2. Remove the Reader Head's lid and try adjusting trimmer RB1 as described in section 3.6.
3. Wheel is being spun too fast or too slow. The ARH is designed to work up to 40rpm, so normal wheel speed should not be a problem. The minimum speed is about 20 seconds per revolution.

6.2 White Ball Detection Problems (Winning Number)

These will manifest themselves in one of two ways – firstly not detecting the winning number and secondly detecting a winning number when there is no white ball.

If the white ball is not being detected, first of all check the white ball sensor beam is pointing at the centre of the viewable white ball target. Next follow the procedure described in section 3.5.

If the white ball sensor is detecting a white ball when it shouldn't be (as indicated by LED3 flashing), then the threshold is too low. First of all switch off Mode Switch setting Switch 3 – this reduces the LED sensor light level output and therefore reduces the sensitivity slightly. Secondly, try pointing the white ball sensor beam in a slightly different place on the white ball – for example slightly higher or lower. Thirdly, use the manual trimmer RB1 as described in section 3.6.

Note the threshold is dynamic and the sensing will only work properly when the wheel is turning, therefore alignment should only be done under these conditions.

Some casinos use a white ball with a small logo on it – typically in a darker colour than the white ball. There is a very small chance that when using one of these balls, it may land in the pocket with the logo directly facing the ARH such that the ball no longer appears fully white. If this is thought to be the problem, manually adjust the white ball threshold to be slightly lower as described in section 3.6.

6.3 No More Bets Sensor Problems

The symptoms here will be no NMBs being displayed on the graphical display (if enabled) and no or inconsistent pulsing of the middle LED. First of all check via the graphical display menus (see the "TCS Winning Number Display System" product manual) that the NMBs option is enabled.

Then spin the white ball in the rim and see if LED2 flashes once for each pass of the white ball. If it does not, or if LED2 flashes more than it should (or typically may flicker) when there is no ball in the rim then the threshold setting for the sensor will need changing. This is very unlikely as the factory default setting should work for virtually all wheels. Remove the Reader Head lid and adjust the trimmer BR as described in section 3.6.

Appendix A: Internal Layout

This shows the position of the sensors, switches, trimmers, and LEDs on the circuit board.