Scoring & Timing Solution for Water polo

1. Introduction

This is a professional solution for LED scoreboard display in gymnastics competition.
The system functions conform to international competition rules.
Match arrangement, real-time scoring & timing display, players' & referees' info display, rank statistics export & print, slow motion video record & playback, and advertising display can be realized through the coordination of Match Scoring System, Meet Management System, Video Arbitration System, etc.

Applicable rules of the system:

● 《FINA WATER POLO RULES 2019 – 2021》

2018 Water Polo Competition of the 15th Guangdong Games

1.1 System Architecture

The whole system is composed of several subsystems, including: Match Scoring System, Meet Management System and Video Arbitration System.

Each subsystem can not only work independently, but also work together to share the data.

It is flexible for customers to configure according to the actual application.

- **Match Scoring System**

Match Scoring System named ULTRA SCORE is composed of Ultra Score Software, Scoring & Timing Host, Referee Timing and Scoring Terminal, Single Side Shot Clock, Penalty Screen, Electronic Buzzer, Water-polo Timeout Button, etc.

It is mainly operated by the referees to realize the scoring and timing work and real-time scoreboard display.

- **Meet Management System**

It is composed of Meet Management Server, On-Venue Results Workstation, Printer, etc.

Linking with Online Registration System and Match Scoring System, it can realize: participants management, match schedule, result management, court arrangement, rank statistics, etc.

- **Video Arbitration System**

Video Arbitration System named PARROT is composed of video arbitration server, control panel and cameras.

It is operated by the referees during the match. When working with Match Scoring System, referee's score operation will be marked on the frame of video automatically, whilst playback them in slow motion with changes in speed.

It can be used to provide the technical support when dispute happens during the match so as to reduce the misjudging, to ensure fairness and justice of the match.

1.2 System Structure
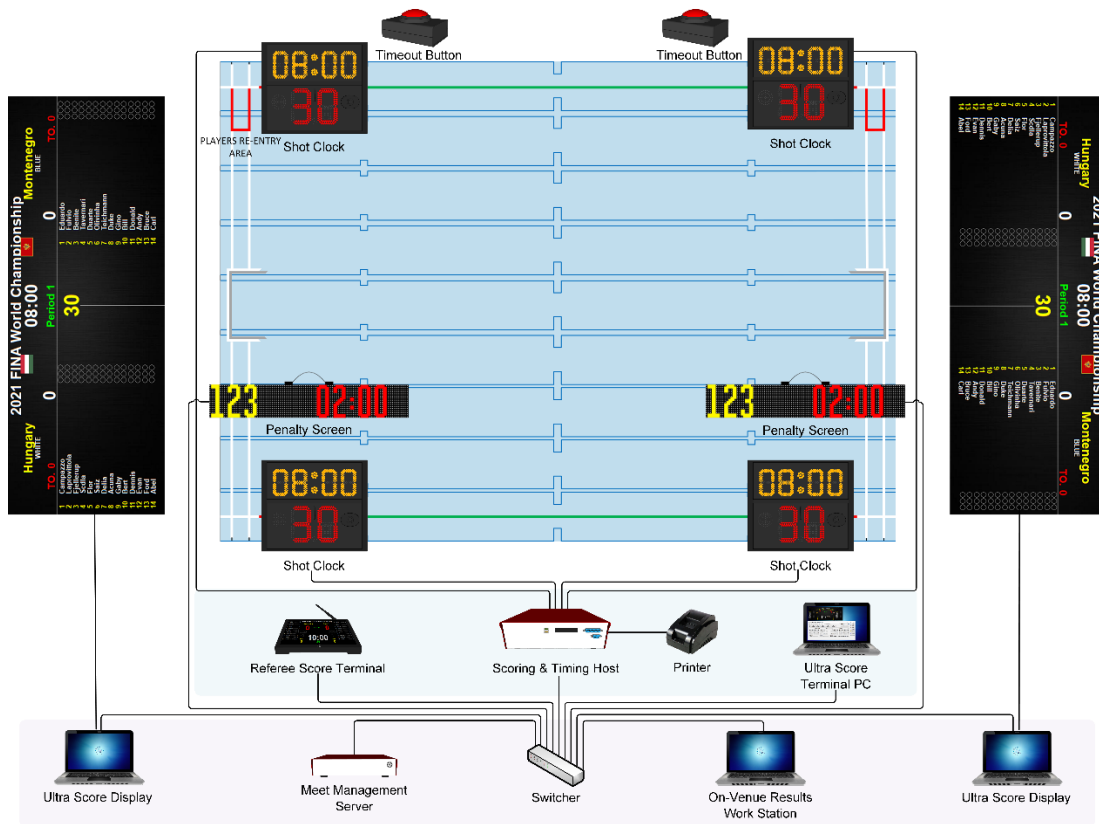
System Description

1) **LAN:** A LAN is set up in the stadium. Connect the LED control PC, Ultra Score Terminal PC, Match Scoring & Timing Host, Referee Scoring & Timing Terminal, Meet Management Server, On-Venue Results Workstation and Printer to the LAN.

2) **Scoring & Timing Host:** It is the core scoring & timing equipment which is installed in the Officials Table and has the function of hot backup. It is used the special cables to connect the Shot Clock and Printer to the host.

3) **Referee Timing and Scoring Terminal:** It is Installed in the Officials Table for referee's operation of score and penalty. It can be connected to the LAN through network cable or WIFI.

4) **Single Side Shot Clock:** Four shot clocks installed on the basketball backboards and connect with Match Scoring & Timing Host with 5-core cables or through wireless communication.

5) **Penalty Screen:** It is installed on both sides of the field to display the player number and penalty time.

6) **Timeout Button:** It is used for teams to initiate a suspension.

7) **Meet Management Server:** It is the core data processing equipment which is installed in the Technical Table and connected to the LAN by network cable.

1.3 Product Configuration

Product	Type	Qt.
Match Scoring System		
Ultra Score Software	◆ Standalone Edition ◆ Support: Gymnastics	1
Match Scoring & Timing Host	KS-MONSTER	1
Referee Timing and Scoring Terminal	KS-GC18	1
Score Console (optional)	KS-GC16	1
Single Side Shot Clock	KS-BASH-C/S	4
Electronic Buzzer	KS-BUZR	3
Timeout Button	KS-WPBN	2
Penalty Screen	KS-SCRN-LED960160	2
Meet Management Server	KS-MMS-MINI	1
PC	/	2
Printer	/	1
Video Arbitration System		
Video Arbitration Server	KS-PARROT-2C	1
Control Panel	KS-PARROT-CP	1
HD Camera	KS-PARROT-CAMERA	2
Tripod for HD Camera	TRIPOD STANDARD	2
SDI Cable	15m	2
LCD Monitor	21.5 inch	1
Router	/	1

2. Specification for products

2.1 Ultra Score Software

Products	Details
Ultra Score	◆ Standalone edition ◆ Supports: Water polo ◆ Including 1 dongle
Ultra Score	◆ Standard network edition (Terminal + 1 Display) ◆ Supports: Water polo ◆ Including 1 dongle
Ultra Score	◆ Professional network edition (Terminal + Referee + 2 Display) ◆ Supports: Water polo ◆ Including 1 dongle

Difference:

Standalone Edition:

Match management, Scoring, and Media display functions, all in one installed on a PC. Referee must do operation on the PC for display directly.

It is suitable for the stadium where has just one screen, which doesn't have strict needs of the scoring and timing accuracy.

Standard Network Edition:

Score terminal and media player functions can be installed on 2 PCs respectively. So that one independent PC can be setup on the courtside special for referee's operation, the other PC running as media player to manage the LED display.

It is suitable for the stadium where has one screen, needs to do the scoring and timing on the courtside.

Professional Network Edition:

Except the function of score terminal, 1-3 media players can be equipped on PCs separately, in order to display different contents on several LED screens.

It is suitable for the stadium where has more than 2 screens where referee need to do scoring on the courtside and LED screens need to display different contents separately. (For example, one LED screen is for scoreboard and another is for advertising or player info).

Scoring interface for water polo

Score:

Player:

Referee:

Water polo World Championships

Name   Country

Stats:

Match Name

Team Name				Team Name		
No	Name	Score	Foul	No	Name	Score	Foul
1	Kovodov	0	0	1	Yang Jun	0	0
2	Cristina	0	0	2	Teng Fei	0	0
3	Meridoni	0	0	3	Liu Ping	0	0
4	Maria	0	0	4	Sun Yujun	0	0
5	Rioch	0	0	5	He Jin	0	0
6	Arkinsti	0	0	6	Sun Yating	0	0
7	Asimaki	0	0	7	Song Donglun	0	0
8	Lompercy	0	0	8	Chen yuan	0	0

2.2 Match Scoring & Timing Host

Item	Details
Match Scoring & Timing Host	Type: KS-MONSTER Size: 260 x 280 x 80 (mm) Weight: 3KG CPU: Intel J3160 RAM: 8GB Hard Disk: 64GB Video Output: VGA×1, DP×1 Port: G-Port×8, Shot Clock port×2, Audio×1, USB×2, Serial port×1 Accessories: Match Timer Handheld *1, Shot Clock Handheld *1 ◆ Timer functions: Timing in minute, second, tenth of a second, 20S & 30S and timing in count up and count down, start, pause, reset, correct are available. ◆ Scoring functions: Modify the score of the team and player. ◆ Penalty functions: Team foul control, Player foul control, Player penalty time control, Substitution control, yellow/red card control, etc. ◆ Synchronous control of 24s Shot Clock and Electronic Buzzer. ◆ Supports hot switching of the main and backup servers. In case of the main server fails, just manually switch to the backup server to ensure the data intact. And in case of power failure, the previous screen will be restored after restarting.

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2.3 Referee Timing & Scoring Terminal

Item	Details
Match Scoring & Timing Host	Type: KS-GC18 Size: 281 x 173 x 39 (mm) Touch LCD: 11.6 inch Resolution: 1920*1080 OS: WIN 10 Battery: No Built-in Battery Communication: LAN / WLAN Hard Disk: SSD 180GB RAM: 8GB Video Output: HDMI*1 ◆ Timer: Includes minute, second, deci-second, 20S and 30S timing function. And also have count up, count down, start/pause/reset/correct timing functions. ◆ Scoring function: Modify the score of the team and player. ◆ Penalty function: Team foul control, Player individual foul control, Player Penalty control, Substitution control, Player yellow/red card control, etc.

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2.4 Wired / Wireless Score Console

Item	Details
Score Console	Type: KS-GC16 Size: 330x290x140(mm) ◆　Used with the Ultra score software ◆　Communication: 1*Ethernet, 1*WIFI ◆　With 7" full color LCD screen ◆　Material: Plastic ◆　Support: Water polo ◆　Functions: Modify score, foul, control the competition time and shot clock, etc.

2.5 Shot Clock

Item	Details
Shot Clock	Type：KS-BASH-C/S Size：710x610x60 (mm) ◆ Single side ◆ Weight: 10KG*4 ◆ Power: 60W*w4 ◆ Buzzer: 110dB ◆ Material: Aluminium ◆ Communication：Wired + Wireless(433MHz) ◆ Match Timer: Decisecond display in last 1 minute ◆ Shot Clock: Decisecond display in last 5 second; Switch 20s/30s display ◆ Buzzer: Two different buzzer sound for match timer and shot clock ◆ Synchronous controlled by score console
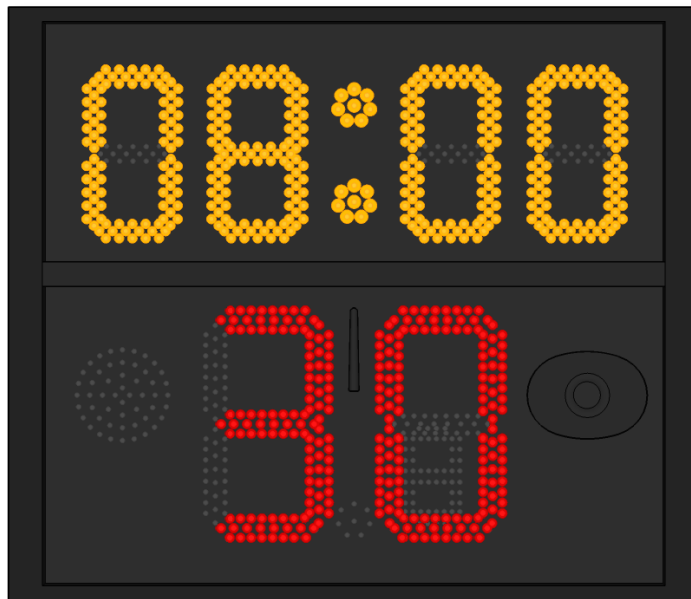
2.6 Communication Spool

Item	Details
Communication Spool	Type：KS-WPSH-W ◆ Size: 365x240x415 (mm) ◆ Material: Iron

2.7 Electronic Buzzer

Item	Details
Electronic Buzzer	Type：KS-BUZR Buzzer for tips as the competition required.
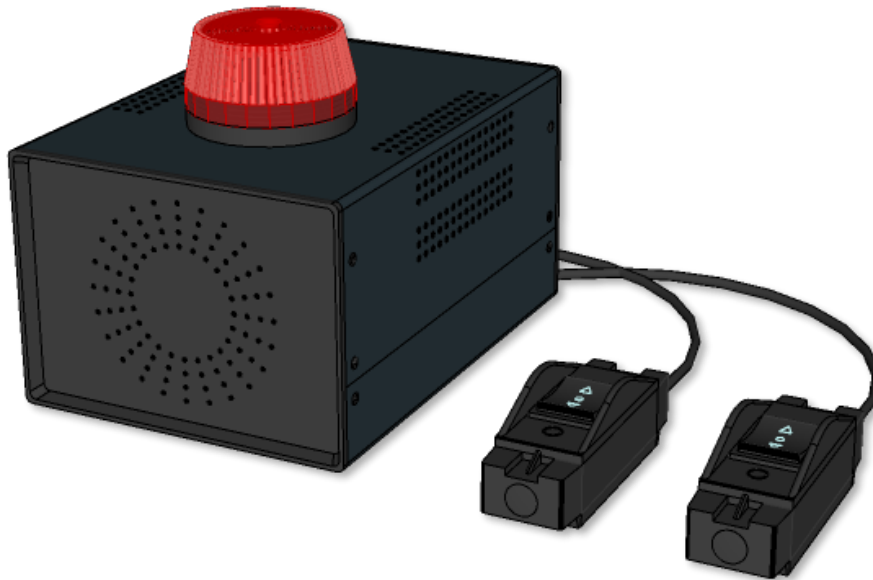
Parameters

Buzzer	KS-BUZR
Basic parameters	
Input Voltage	AC~220V±5%
Total Power	35W
Color	Black
Weight	1KG
Buzzer	110dB
Product Configuration	
Packing List	Host*1 Handheld*2 Power Cable*1 Power Adapter*1
Refresh frequency	80HZ--90HZ

2.8 Water-polo Timeout Button

Item	Details
Water-polo Timeout Button	Type：KS-WPBN ◆ Size: 164x100x75 (mm) ◆ Material: Plastic ◆ Function: Be used by the team to start a timeout.

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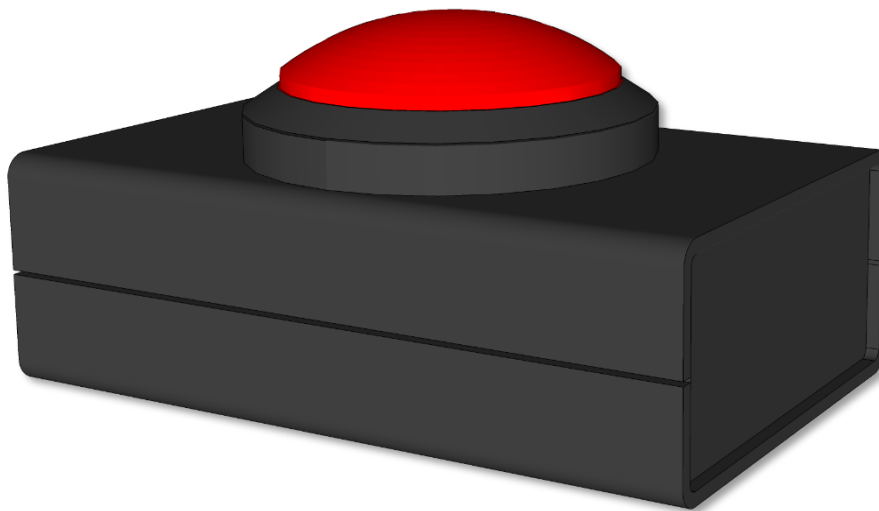
2.9 Water Polo Penalty Screen (Single Line)

Item	Details
Water Polo Penalty Screen (Single Line)	Type: KS-SCRN-LED960160 Size: 960*160*100(mm) Material: Aluminum Input: 48V DC Function: ◆　Must be used together with Water-polo Scoring Software. ◆　Display athlete's number and penalty time.

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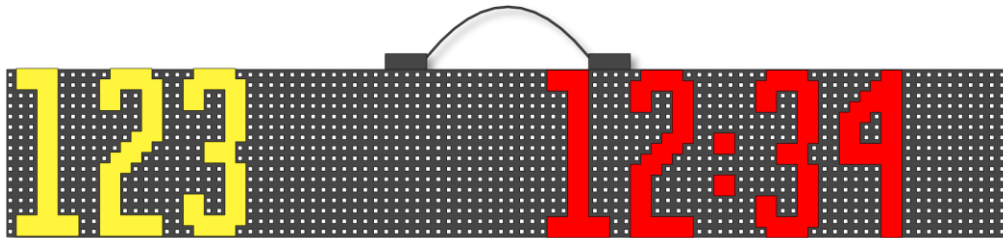
2.10 Water Polo Penalty Screen (Triple Line)

Item	Details
Water Polo Penalty Screen (Triple Line)	Type: KS-SCRN-LED960480 Size: 1080*600*145(mm) Material: Aluminum Function: ◆　Must be used together with Water-polo Scoring Software. ◆　Display athlete's number and penalty time.

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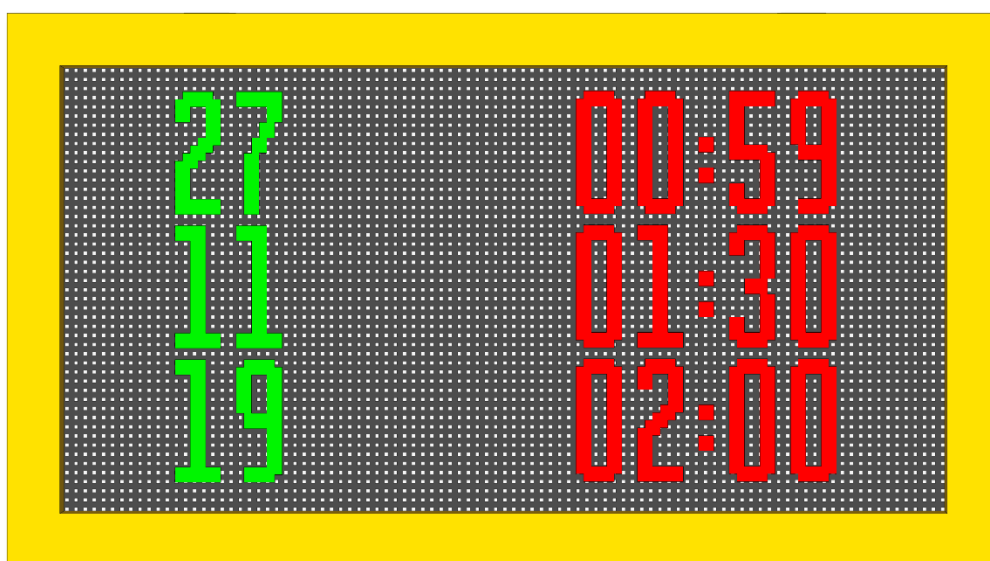
2.11 Meet Management System

It is composed of Meet Management Server, On-Venue Results Workstation, Printer, etc.

Linking with Online Registration System, Match Scoring System and Basketball Stats System, it can realize:

1) **Participants Management:** Information management of players, teams and referees. Both import and input registration form are available. And auto generate the order form.

2) **Match Schedule:** Auto draw the players' lots. Multi-project arrangement make the schedule more smoothly. Auto generate the bracket, order form and round form.

3) **Result Management:** Receive or record the results. Determine the players' rank, admission or elimination at each stage. Print the results announcement and send to the LED display system, TV broadcasting system and comprehensive meet manage system.

4) **Technical Statistics Arrangement:** Combine with the basketball stats software, it can summarize the info of teams' score, teams' timeout, teams' foul, players' substitution, players' foul, players' comprehensive results, and generate the integrated report.

2.11.1   System Diagram
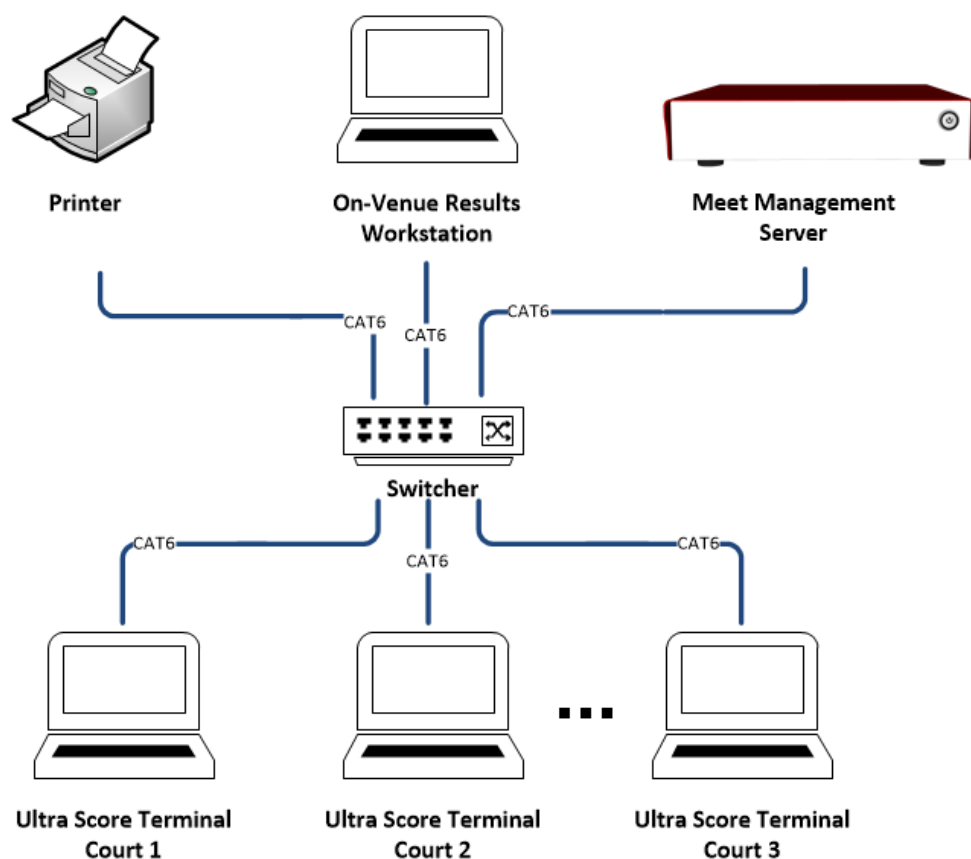
2.11.2 Meet Management Server

Products	Details
Meet Management Server	Type：KS-MMS-MINI Size: 170x150x35 (mm) Weight: 1.0 KG Features: ◆ Multi-court arrangement, auto generate the order form. ◆ Multi-project arrangement, make the schedule more smoothly. ◆ Monitor the status of each court in real time, including the current field, rotation and player info. ◆ Court adjustment, can manually modify the match court and session info. ◆ Summary and print integrated report.

2.12 Video Arbitration Server

Video Arbitration System named PARROT is composed of video arbitration server, control panel and cameras.

It is operated by the referee during the match. When working with Match Scoring System, referee's score operation will be marked on the frame of video automatically, whilst playback them in slow motion with changes in speed.

It can be used to provide the technical support when dispute happens during the match so as to reduce the misjudging, to ensure fairness and justice of the match.

Application:

Aerobics, Basketball, Volleyball, Soccer, Handball, Boxing, Wrestling, Wushu, Judo, Jujitsu, Karate, Taekwondo, Gymnastics, Swimming, Diving, Ice-hockey, Weightlifting, etc.

2.12.1   System Diagram
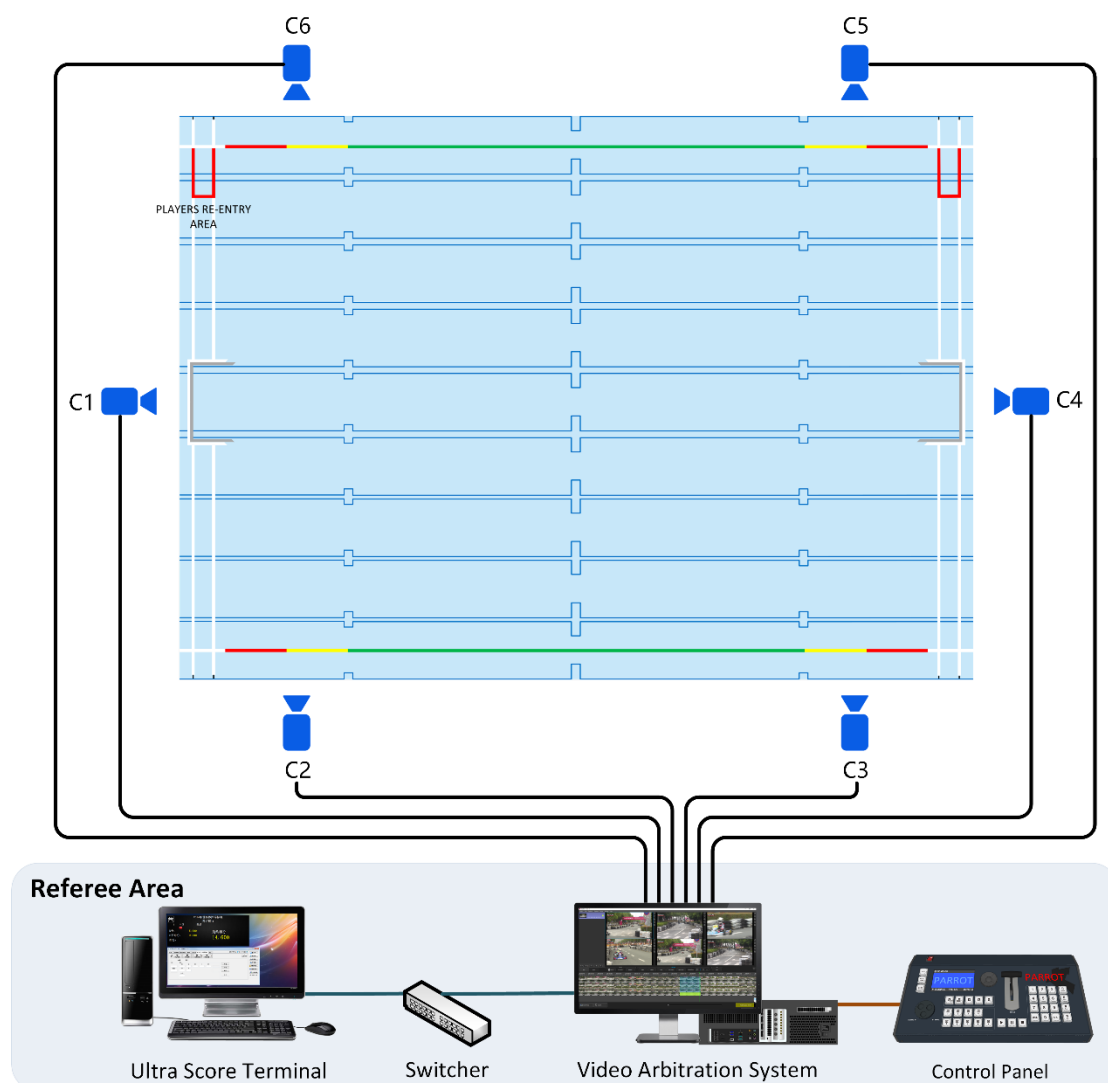
2.12.2   System Description

1) Ultra Score software is installed on the control computer. Connect the control computer and the video arbitration server to the local network.

2) 1-8 sets of HD cameras are installed around the count which connects to video arbitration server via SDI cable.

3) Control panel is connected to video arbitration server via a USB cable which makes referee easy to check the playback process and control the speed of slow motion.

4) Video arbitration server provides an output video signal which can be connected to LED/LCD display for live slow motion replay.

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2.12.3   Functions

1) **Nonstop video recording in the background:** 1-8 channels of HD video are recorded simultaneously in the background, nonstop for 10 hours. Video retrieval and playback is unaffected.

2) **Synch-playback of multi-channel video:** Supports playback mode of single channel video in full screen and multi-angle video in 6 windows.

3) **Speed change in slow motion:** supports 20 frame/s video playback and capturing motion in a grid of 0.05s. The function of frame freeze, fast playback, 1/2 slow playback, 1/4 slow playback and dragging progress bar is available.

4) **Video event query:** video stream can be divided into several video events, storing in the event list, which can be renamed for retrieve easily.

5) **Video segment marker:** Important or controversial moments can be marked in video stream which will be replayed quickly when clicking the marked records.

6) **Professional playback control panel:** configuring T-bar, slow moving wheel, speed preset function keys to make the process more convenient.

7) **Video signal output:** provides 2 video output signals, one of which is for preview, the other of which can be connected to LED/LCD display for live slow motion replay.

Working with Ultra Score System to realize:

◆ **Auto generate video event:** Video events will be generated automatically for quick query according to the match data that has been preset in Ultra Score.

◆ Real-time match timer will be superimposed on the video.

◆ **Referee's operation record:** Referee's every scoring and timing operation can be recorded into the video, showed below the frame when that moment happened.

◆ **Player's point record:** Player's point can be recorded into the video, showed below the frame when that moment happened.

◆ **Open developer API:** Just connect your own scoring system onto this Video Arbitration System, so you may record all kinds of events together with the videos.

2.12.4   Video Arbitration Server

Products	Details
Video Arbitration Server	Type: KS-PARROT-2C/4C/6C/8C Video Input: 2/4/6/8 channels input synchronously; Input port: SDI; Output port: DP*2; Video Format: 1080P; Recording capacity: ≥ 10 hours; Multi-screen monitoring: supported; Weight: 8kg.

Software interface

Device Specification

Type	KS-PARROT-2C/4C/6C/8C
Size	485x480×90(mm)
Net Weight	8 KG
Color	Black
Cabinet	Iron
Interface	
Input	SDI*2/4/6/8
Output	DP*2
Environmental	
Operating Temp	-5℃～45℃
Storage Temp	-40℃～80℃
Relative Humidity	5%～95%, non-condensing
Input Voltage	AC 100V~240V
Functions	

◆ **Nonstop video recording in the background:** 2/4/6/8 channels of HD video are recorded simultaneously in the background, nonstop for 10 hours. Video retrieval and playback is unaffected.

◆ **Synch-playback of multi-channel video:** Supports playback mode of single channel video in full screen and multi-angle video in 2/4/6/8 windows.

◆ **Speed change in slow motion:** support 50 frame/s video playback and capture motion in a grid of 0.02s.

◆ **Video event query:** video stream can be divided into several video events, storing in the event list, which can be renamed for retrieve easily.

◆ **Video segment marker:** Important or controversial moments can be marked in video stream which will be replayed quickly when clicking the marked records.

◆ **Video signal output:** provides 2 video output signals, one of which is for preview, the other of which can be connected to LED/LCD display for live slow motion replay.

2.12.5 Control Panel

Products	Details
Control Panel	Type: KS-PARROT-CP Function: ◆ Support one touch replay, deferred replay, in/out replay. ◆ Preset speed button. ◆ T-Bar for dynamic slow motion. ◆ Professional dynamic jog wheel. ◆ Key to mark the last 10s/20s of the video content. ◆ Flexible select the marked video and playback.

Device Specification

Type	KS-PARROT-CP
Size	365 x 200 x 98 (mm)
Net Weight	1 KG
Cabinet	Iron
Display	Color LCD(4.3Inch)
Sound	None
Communication	
USB	≤5m
RS232	≤10m
Environmental	
Operating Temp	-5~45℃
Relative Humidity	5~95 %, non-condensing
Storage Temp	-40~80°C
Input Voltage	AC 100V-240V
Total Power	15W

2.12.6   HD Camera

Products	Details
HD Camera	Type: KS-PARROT-CAMERA

Device Specification

Product Type	KS-PARROT-CAMERA
Video output	3G-SDI
Effective pixels	3.0 million
Max Resolution	1920*1080
Max Frame rate	60FPS
Sensor	CMOS
Focal length	4.2MM
Size	62.5*50*50MM