DUKANE™
Commercial Sound Technology

Wireless Timekeeping Equipment

Overview

Edwards wireless clock solutions comprise a reliable master/slave cascading network that synchronizes clocks from a central on-site master controller. The master clock receives highly accurate time signals from an NTP or GPS source and relays timecodes to local slave clocks via wireless signals.

Each clock in the system is capable of receiving and transmitting the wireless signal which allows it to be used as a repeater while boosting the data stream and sending along the system. With this dual capability there is no limit to the number of clocks that can be installed throughout highrises, sprawling facilities, and small buildings alike.

Because the signal fans out and is repeated by a cascading number of devices, a single clock will typically receive its data from a number of different angles. This dramatically reduces the effect of obstructions, noise sources, or long distances on the reliability of the system. Furthermore, if an individual clock looses its signal, it will link to a nearby clock and automatically synchronize with that new source.

The cascading network also reduces system setup and installation costs, thanks to the relatively low signal strength that is necessary for it to function efficiently. This eliminates the expense and time required to obtain an FCC license.

The Dukane Model 24ZB20 and 24ZB40 Secondary Clocks provide a highly visible, even-intensity, long-life display of time in selectable formats. They can be operated in either 12- or 24-hour format, and at either Bright or Normal intensity levels. The time display on the secondary clock updates to the master clock time at one-minute intervals. These cost-effective digital clocks can be used in a wired time-keeping system or, with the addition of the optional ZigBee module 24ZBM2040, can be installed on a wireless system. See data sheet 85098-0003 for more product information and mounting options.

Standard Features

- ZigBee open protocol cascading wireless network
- Master clock supports GPS or NTP time source
- Slave clocks act as signal repeaters for enhanced reliability
- Easy to install: low voltage power and signaling; no wiring, no FCC radio license required
- Intuitive browser-based setup
- Digital clocks support count-up/count-down timers and message actuation via wall button (Edwards-24ZB266 and Edwards 24ZB456 only) or via remote, or event timing
- Date and time clocks support English, French and Spanish formatting
- Digital clocks are powered via plug-in 110 Vac transformer
- Analog clocks may be powered by plug-in 110 Vac transformer or by batteries.
- Master Clock V2.3 program digital secondary clocks to count-down class change or break times

110-3693 AC Clock Power Supply
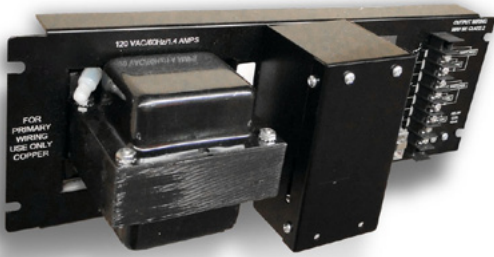
The AC Clock Power Supply provides a convenient 24Vac source for operating synchronous clocks and bells. The low voltage and current output of this power supply allows Class 2 wiring to be used. An onboard relay allows clock correction coils to be easily interfaced with Edwards master clocks. This supply mounts with the standard Edwards power supply backbox and doors.

Features

- Continuous duty operation
- Easily accessible fuses
- Screw terminal outputs
- Includes correction coil relay
- Outputs permit class 2 wiring

Application

Edwards wireless clocks are ideal wherever synchronized time-keeping is desirable, including schools, hospitals, workplaces, transportation terminals, commercial settings, and industrial facilities. A wide selection of analog and digital slave clocks are available, as is a flexible range of mounting and installation options.

Edwards master clocks easily interface to paging and intercom systems such as Dukane's StarCall for tone generation and audible signaling for bell schedules. They also conform to the open communications standard adopted by the ZigBee alliance of manufacturers, giving them interoperability with a wide range of wireless automation platforms available today and in the future.

Configuration

Edwards wireless clocks are easy to configure thanks to Dukane's exclusive browser-based setup tool. Simply log in to the master clock for intuitive and easy-to-use on-screen configuration.

Engineering Specifications

System

1. ZigBee based wireless analog and/or digital clock system with interface capability to GPS, network, Internet. Because of ZigBee low transmission RF power; this system is better for health compare to other vendor's high power transmitter. No dedicated repeater required, each clock can acts as a receiver and a repeater.

2. The system can work as a stand-alone system or interface to GPS, network, Internet for time synchronization.

3. The system shall be designed to work in an environment where cabling options are not available.

4. The system shall be capable of working in 2.425–2.480 GHz frequency range, which is IEEE 802.15.4 standard. (Default 2.450GHz, ZigBee compliance Platform).

5. Easy to add clocks and easy to move location of existing clocks, no signal wires required.

6. All hardware shall operate in the following environment conditions

   a. Operating temperature: 50 deg F to 120 deg F (10 deg C to 49 deg C)

   b. Humidity: 10% to 95% non-condensing

   c. Shall meet clean room requirements

7. Each clock in the system shall be capable of receiving and transmitting the wireless signal, which allows it to be used as a repeater while boosting the data stream and sending along the system. With this dual capability there shall be no limit on the number of clocks that can be used in the installation. The clock shall be designed to automatically work together without interference with each other. The system shall be capable of increasing the quality of the signal while increasing the quantity of the clocks.

8. The digital clocks shall be capable of working in one (1) of the following options:

   a. 110 volts AC; the clock receives and transmits time every one (1) second.

   b. 24 volts AC/DC; the clock receives and transmits time every one (1) second.

9. The system shall operate in a license-free frequency range where no license is required.

10. System synchronization time from master to slave clock and slave-to-slave clock (one repeater jump) shall not exceed 0.007 seconds (7mS), maximum jump time is 19; maximum delay should be 0.13 seconds (133mS)

11. Time Synchronisation of the clocks shall occur ever second for digital clocks and twice a day for analog clocks. The master clock shall be capable of programing break time or classroom change times and place all

digital secondary clocks in count down mode to show time remaining and then switch back to standard time display.

12. Time Synchronisation of the clocks shall occur every second for digital clocks and twice a day for analog clocks.

FCC Approval

1. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

UL Listings:

1. UL 863 - Standard for Time -Indicating and -Recording Appliances - Edition 8 - Revision Date 2009/11/03

Product

1. Transmitter/Transceiver

   a. The Master Clock / Transmitter shall be the Edwards 24ZBMC100. The transmitter shall be capable of transmitting data to the 24ZBP12R and 24ZBP212R series wireless analog clocks and the Edwards-24ZB266 and Edwards 24ZB456 series wireless digital clocks.

   b. 4 programmable output contacts

   c. The transmitter shall be capable of receiving a time signal from:

      i. From an atomic clock web site via the Internet

      ii. From a GPS source (Support NMEA0183 communication protocol)

   d. From a NTP source (minimum update every 10 seconds)

   e. The master clock shall support a web page interface to manage the output contact schedules. Each output contact shall include the following capabilities

      i. Up to 48 events

      ii. Time-of-day settings down to the minute.

      iii. Day-of-the-week settings:

         1. Individual days of Sun, Mon, Tue, Wed, Thu, Fri or Sat

         2. Mon through Fri

         3. Sat and Sun

         4. Mon, Wed, and Fri

         5. Tue, Thu and Sat

         6. Everyday

      iv. Duration control from 1 to 59 seconds in increments of 1 second.

      v. Separate "On" and "Off" duration control to allow activations of more than 59 seconds using time-of-day and day-of-week settings.

   f. Will have in PC application that allows setting up of the master clock and bell schedules.

   g. Master clock firmware will be updated via software download.

   h. The master clock shall be accurate to 0.2 seconds per day with loss of synchronization with the time standard.

   i. The master clock shall include a standard 10-100 BASE-T half-duplex Ethernet connection

   j. The master clock shall include an internal clock reference so that failure of the primary time receiver shall not cause the clocks to fail in indicating time.

   k. Master Clock should support UTC (Coordinated Universal Time).

   l. The master clock shall be able to support the synchronization of up to 65000 slave clocks.

   m. The transmitter of each wireless clock shall be capable of acting as a repeater while receiving a signal wired or wirelessly from the main transmitter.

   n. Each output contact shall support a common, normally open and normally closed connection (COM, NO, NC), and shall be capable of 5A @ 24 VDC or 120 VAC.

   o. Shall support global daylight saving time changes and different time zones.

   p. The transmitter shall utilize 2.425–2.480 GHz frequency range, which is IEEE 802.15.4 standard. (Default 2.450GHz, ZigBee compliance Platform).

   q. The transmitter shall be FCC and UL compliant

2. Digital Clocks Repeater (secondary Clocks)

   a. The repeaters shall be the Edwards 24ZB266 and Edwards 24ZB456 series wireless digital clocks. The repeater shall have an RF input sensitivity of –104 dbm. The repeater is to have a RF power output of -7 to max.18 dbm (configurable, default 15dBm).

   b. The clock shall be the Edwards 24ZB266 and Edwards 24ZB456 series wireless digital clocks and shall have either a full 2.6" or 4.5" high efficiency red LED numeral display.

   c. The clock will operate as a wireless digital slave clock.

   d. The clock shall receive signals from other clocks in the surrounding area or from the transceiver. The clock shall receive and transmit 2.425–2.480 GHz frequency range, which is IEEE 802.15.4 standard. (Default 2.450GHz, ZigBee compliance Platform).

   e. The clocks will be capable of transmitting and receiving the time without interfering with each other.

   f. It shall have a 12 or 24-hour display format.

   g. Date version clocks will display month and day in any combination of English, Spanish, or French languages, which can be programmed on the fly via IR remote.

   h. Shall support count up/down timing via remote

   i. The clock will have a minimum of seven (7) levels of adjustable brightness, which can be programmed on the fly via IR remote.

   j. Clocks will feature immediate correction for time changes.

   k. The digital clock shall be capable of being installed either surface or double mount.

   l. Secondary clock will sync with the next strongest signal if it loose contact with its first sync source.

      vi. When the synchronization input is lost, the colon on the display of the clock shall flash.

      vii. The clock shall have an anti–glare bezel with a smooth surface.

      viii. No external screws shall be visible on the bezel or clock housing.

      ix. The clock shall be FCC and UL compliant

3. Analog Clocks:

   a. Shall have the option to be powered by alkaline battery, central 24AC power supply or 110 Volt AC

   b. Analog clock shall support 12-hour or metric 24-hour time.

   c. Have plastic or metal frame options

   d. Support dual face wall or ceiling mounting

   e. When operating in battery mode the clocks will sync twice per day to conserve battery power

   f. 12" Metal analog clocks shall be able to be mounted in optional dual face configuration.

Hardware Specifications

Master Clock

Operating Current	Powered by an AC Adapter from 120VAC to 19V 3A UL/CSA, CE approved AC cord with U.S. type 3 prong grounded plug, or directly from AC24V
Storage & Operating Environment	50 to 120° F (10 to 49° C); Humidity: 10% to 95% non-condensing
Agency Listings	UL /CSA, FCC
Construction and Finish	Black metal
Master Clock Mounting	Configured as a 19" Rack mount. "Computer Server Black" metal case, 435mm (W), x 295mm (D), x 45mm (H)
Transmitting power from master clock	Approximately 0.06W at 2.450~2.480Ghz.
Synchronization time from master to slave clock and slave-to-slave clock (one repeater jump)	Not to exceed 0.007 seconds (7mS), maximum jump time is 19; maximum delay 0.13 seconds (133mS)
Time Synchronization	NTP or GPS Master Clocks are synchronized every second; the system has an internal oscillator that maintains plus or minus one second per day between synchronizations so that clock accuracy does not exceed plus or minus 0.2 seconds.
Relay Contacts	4 relay dry contact O/P (NC, C, NO), 5A, Programmable timer for bell operation or lamp on/off control
Scheduling	Supports an interface for a software application to manage bell/tone schedules and count down time breaks of class changes
Master clock	Supports the synchronization of an unlimited number of slave clocks or digital displays.
GPS Antenna	Operating temperature: 50 to 104° F (10 to 40° C); Humidity: 0% to 95% non-condensing, Length of signal cable: 4.5 meters optional 50 meter extension cable, window or roof mounted
Regulatory information	North American standards: FCC Part 15, Subpart A, Subpart C; Canadian ICES-003; CSA C108.8; UL 863 Additional rules and guidelines: ZigBee Alliance (http://www.zigbee.org/en)

Digital Clocks

Mounting	Wall mount and ceiling mount
Daylight Saving Rules	Factory set. Reconfigurable to any new rule without a hardware update.
Slave clocks	Act as repeaters. Maximum repeat time is 19; average transmission range should be 100 meters. Line of Sight (LOS) range (nothing blocking) will be 200 meters. It is expected that there will be one slave clock on each floor, within close proximity to each other, when supporting a multi-floor configuration. Synchronization time from master to slave clock and slave-to-slave clock (one repeater jump) shall not exceed 0.007 seconds (7mS), maximum jump time is 19; maximum delay should be 0.13 seconds (133mS). The slave digital clock colon stays lit when the clock is synchronized. If more than seven minutes elapse with no data received from the master clock, the slave clock will run on its time based (crystal) and the colon will flash.
Code Blue	Edwards 24ZB266 and Edwards 24ZB456 interface to Nurse Call systems that support relay pulse interface to start code blue count up. When invoked, a relay/pulse is sent to the timer, which triggers it to begin counting up. If a code blue status is in effect, it will take priority and the timer's previous task will run in the background until the code blue function is stopped. A switch control allows the user to operate the timer in multiple modes. (3.0mA max. @ 5vac/dc–120vac/dc)

Analog Clocks: see list below for part numbers

Self running accuracy	Within two seconds per day.
Adjustment	Sensors automatically position hands. No manual adjustment necessary.
ZigBee transmission frequency	2.475GHz
FCC & IC approval wireless module	FCC ID:RF2IPLINK12235142, IC ID:8576AIPLINK5142
Antenna	Internal
Working time on battery power	Four years or more. AC power and central power options also available.
Physical	12" (345mm) dia X 61mm depth 1.0 Kg or 15" (430mm) dia X 45mm depth 2.0 Kg
Frame	Plastic or metal with shatter proof plastic face

110-3693 AC Clock Power Supply System

Rated Outputs	24Vrms @ 5A unregulated total (two separate 2.5A outputs)
Rated Input	120Vac, 60 Hz, 1.4A
Relay Input/output	Coil rated 24Vdc @ 40mA Contacts rated 10A resistive with 240Vac or 30Vdc maximum

Ordering Information

Model	Description
Master Clock/Transmitters	
24ZBMC100	Master Clock, NTP/GPS time based, with ZigBee transmitter/receiver, UL Listed, AC Adapter, 650 x 400 x 200 mm / 5.0 kg
24ZBM2040	Wireless transmitter/receiver module

ZigBee Wireless Digital Clocks (Count down/up)

	Size (WxHxD)	Weight	LED Size	LED color	Power in	Current	Included
24ZB20	11.9 x 4.5 x 1.75 in (303 x 114 x 44 mm)	0.8 lb (0.369 kg)	2 in	Red	24Vac (+/– 5Vac)	67mA - Normal 122mA - Bright	Count up functionality with optional wall controller
24ZB40	19.0 x 5.8 x 2.5 in (483 x 147 x 64 mm)	2.5 lb (1.1 kg)	4 in	Red	24Vac (+/– 5Vac)	250mA - Normal 350mA - Bright	Count up functionality with optional wall controller
24ZB266	13.8 × 6.7 × 2.6 in (350 × 170 × 65 mm)	3.5 lb (1.6 kg)	Hours: 2.66 in Minutes: 2.66 in Seconds: 2.0 in	Red	110 VAC	0.2 Amp	Code Blue wired input, mounting hardware, 110 VAC power cord.
24ZB266D	25.8 × 6.7 × 2.6 in (655 × 170 × 65 mm)	7 lb (3.2 kg)	Hours: 2.66 in Minutes: 2.66 in Seconds: 2.0 in Date: 1.2 in	Hours, minutes, seconds: Red Date: Amber	110 VAC	0.4 Amp	Mounting hardware, 110 VAC power cord.
24ZD266DW or 24ZB266W (Double-Faced)	13.8 × 6.7 × 5.1 in (350 × 170 × 130 mm)	10.5 lb (4.8 kg) [1]	Hours: 2.66 in Minutes: 2.66 in Seconds: 2.0 in	Hours, minutes, seconds: Red	19 VDC	12 to 30 VDC 21 Watts	Ceiling mount hardware, 110 VAC power adapter.
24ZB266DW (Double-Faced)	13.8 × 6.7 × 5.1 in (350 × 170 × 130 mm)	17 lb (7.8 kg) [1]	Hours: 2.66 in Minutes: 2.66 in Seconds: 2.0 in Date: 1.2 in	Hours, minutes, seconds: Red Date: Amber	19 VDC	12-30 VDC 33 Watts	Ceiling mount hardware, 110 VAC power adapter.
24ZB456	21.7 × 6.7 × 2.6 in (550 × 170 × 65 mm)	6.2 lb (2.8 kg)	Hours: 4.56 in Minutes: 4.56 in Seconds: 3.0 in	Red	110 VAC	0.2 Amp	Code Blue wired input, wall mount hardware, 110 VAC power cord.
24ZB456W (Double-Faced)	21.7 × 6.7 × 5.1 in (550 × 170 × 130 mm)	15.4 lb (7 kg) [1]	Hours: 4.56 in Minutes: 4.56 in Seconds: 3.0 in	Red	19 VDC	12-30 VDC 21 Watts	Ceiling mount hardware, 110 VAC power adapter.

[1] Stated net weight includes three-step ceiling mounting pole.

Notes:
1. Acceptable low DC voltage operating range
2. Maximum wattage (DC volts × DC amps) over the range of input voltages (worst case)

AC Clock Power Supply		
110-3693	AC Clock Power Supply	7 lb, 1 oz (3.4 kg)
110-2190-SC	Flush Mount Door	3 lb, 13 oz (1.7 kg)
110-2191-SC	Surface Mount Door	3 lb, 7 oz (1.6 kg)
145-184-SC	Backbox	8 lb, 7 oz (3.8 kg)

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ZigBee Wireless Analog Clocks

Model	Format	Diameter	Depth	Weight	Power	Frame
24ZBP12R	12-hr face				Battery power or central 24V AC power supply. Can keep batteries in the clock as power loss backup.	Black Plastic with shatter proof lens
24ZBP212R	12/24-hr face	12 in (305 mm)	2.4 in (6.1 cm)	2.2 lb. (1.0 kg)		
24ZB12R	12-hr face	12 in (305 mm)	1.8 in (45 mm)	2.64 lb (1.2 Kg)	Central 24V or AC adapter power supply	black metal frame with shatter proof lens
24ZB212R	12/24-hr face	12 in (305 mm)	1.8 in (45 mm)	2.64 lb (1.2 Kg)		
24ZB15R	12-hr face	15 in (381 mm)	1.8 in (45 mm)	4.41 lb (2.0 Kg)		black metal frame
24ZB215R	12/24-hr face	15 in (381 mm)	1.8 in (45 mm)	4.1 lb (2.0 kg)		

12" Wireless Dual Face Metal Mounting Kit

Model	Format	Diameter	Depth	Weight	Power	Frame
24ZBDCF12R		12 in (305 mm)	6.2 in (160 mm)	10.36 lb (4.7 Kg)	--	black metal frame with shatter proof lens

Supplemental Clock for Dual Face Kit - 12 hour face

Model	Format	Diameter	Depth	Weight	Power	Frame
24ZB12RSC	12-hr face	12 in (305 mm)	1.8 in (45 mm)	2.64 lb (1.2 Kg)	--	black metal frame with shatter proof lens

Supplemental Clock for Dual Face Kit - 12/24 hour face

Model	Format	Diameter	Depth	Weight	Power	Frame
24ZB212RSC	12/24-hr face	12 in (305 mm)	1.8 in (45 mm)	2.64 lb (1.2 Kg)	--	black metal frame with shatter proof lens

Accessories

24ZBIFR	IR Count Down Clock Actuator Infrared transmitter distance: max. 10 meters (face to the clock), Operating battery: 1.5V x 2 size AAA, Operating time: about 2 years (depends on how often it is used). Also used to adjust or set LED brightness and to set language displayed.
24ZBMCGPS	GPS Receiver with 4.5 m Antenna Cable (Includes Edwards-MC-040)
24ZBMCGPSEXT	50 Meter Extension cable for GPS antenna
24ZBDEMO1A	Demo carrying Kit, in aluminum carrying case with casters, containing each a 24ZBMC100, GPS receiver w/.4.5M ant. Cable & mount hardware, AC adaptor (KPA-060K), 24ZB266D w/AC adaptor, 24ZB456 w/AC adaptor & 4-tap AC receptacle, GE-IFR-2 clock actuator
24ZBDEMO1B	Demo carrying Kit with aluminum carrying case with casters for analog wireless clocks, containing a 24ZB12R and 24ZB212R with AC adaptors Requires 24WCD-01 (A) Demo Kit
24ZBDCELL-2	2 Alkaline D Cell batteries for 24ZBP12R and 24ZBP212R
24ZB2040 ADAPT	AC Power adapter for 24ZB20 and 24ZB40
24ZBPSCABLE-10	Central power cable for 24ZB15R, 24ZB12R, 24ZB212R, 24ZB20, and 24ZB40; Package of 10 cables
24ZB12VDC2A-10	Optional AC Adapter for 24ZBP12R, 24ZBP212R, 24ZB12R, 24ZB212R, 24ZB15R and 24ZB215R (10 Adapters per Package)
24ZBM2040	Optional Mini ZigBee Module for wireless transmitter and receiver on Models 24ZB20 and 24ZB40
24ZBWG1215R	Analog Clock Wire Guard for 24ZBP12R, 24ZBP212R, 24ZB12R, 24ZB212R and 24ZB15R
24ZBWG266	Metal Wire Guard for 24ZB266 digital clock
24ZBWG456	Metal Wire Guard for 24ZB456 digital clock
110-3900	2-gang analog clock hanger plate-optional

DATA SHEET 85100-0139
Not to be used for installation purposes. **Issue 4**

03-20-12