# SAM Series Smart Clock
## Description

Sapling's revolutionary new SAM Series analog clocks incorporate multi–function software which allows the clock itself to identify communication protocols in the field. The clocks contain built–in test procedures for protocol type and last received communication time, as well as a comprehensive analysis of the clock. SAM clocks are fully plug and play; there are no settings required. SAM Series clocks also allows all system clocks to be diagnosed from a remote master clock location. These clocks even contain an automatic polarity detection feature which protects the system in case data is received with reversed polarity. These features provide significant flexibility and responsiveness. The microprocessor based movement automatically identifies anything from a basic sync–wire protocol to a technologically advanced two (2) or three (3) wire digital communication protocol. The SAM Series incorporates our digital communication protocol, which transmits a stream of data that constantly checks and corrects every clock in the system. This feature prevents the clocks from deviating from each other, while providing five (5) minute (max) system correction. Sapling Smart SAM Series analog clocks are compact, energy efficient and reliable. The clocks are available in 12" and 16" round cases. The shallow, low profile metal cases eliminate the need for custom back boxes. By using electronic components, the Sapling Smart SAM Series analog clocks have a much less chance of mechanical failure.
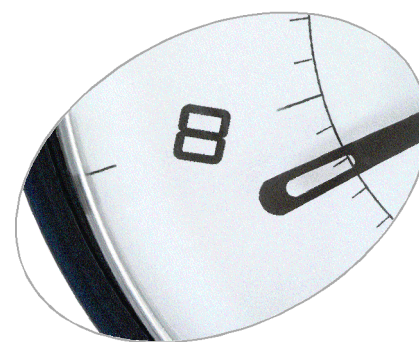
## Highlights

▸ Microprocessor based movement
▸ Two (2) wire or three (3) wire system
▸ Automatic communication protocol identification. The clocks recognize:
  • Three (3) wire digital communication system
  • Two (2) wire digital communication system
  • Sync–wire 59 minute correction
  • Sync–wire 58 minute correction
  • Sync–wire National Time and Rauland
▸ Automatic frequency detection
▸ Diagnostic LEDs for ease of maintenance
▸ Fully automatic plug and play; No settings required
▸ Built–in self–test function
▸ Automatic polarity detection
▸ Remote system diagnosis
▸ Quick correction for time change (max. five (5) minutes) (Digital communication protocol)
▸ Clocks will not deviate from each other (Digital communication protocol)
▸ Ideal for renovation projects using existing wiring, or for new installations
▸ Hour, minute and second hands
▸ Energy efficient:
  • 20 mA@ 24 VAC (voltage)
  • 15 mA@ 110 VAC (voltage)
  • 10 mA correction
▸ Wide dynamic range for input voltage
  • 7 VAC—28 VAC (24 V model, three (3) wire system)
  • 85 VAC—135 VAC (110 V model, three (3) wire system)
▸ Low profile—one (1) model for flush and surface mount
▸ No need for custom back box
▸ Plug in Molex connectors
▸ Smooth surface metal case (custom colors available) or smooth surface ABS plastic case
▸ Side molded, polycarbonate crystal
▸ Available in 110 VAC and 24 VAC
▸ UL, cUL listed and FCC approved
▸ Made in U.S.A.
▸ Patents pending

SAM Series Smart Clock

5

## Architectural & Engineering Specifications

The secondary clock shall be Sapling SAM Series clock with automatic protocol detection. The clock will have plug and play features with no settings required. The clock shall have self–diagnostic capabilities for protocol detection, last received communication time and a comprehensive analysis of the entire clock. The clock will be capable of having remote diagnostic capabilities from the master clock location. The clock shall have automatic polarity detection, as well as a maximum correction time of five (5) minutes. The clock shall be designed to be used in either a two (2) wire or three (3) wire system with Sapling 2000 or 3000 Series Master Clock systems, as well as the SSM Master Clock, which can regulate it by Sapling digital communication protocol. Upon receipt of the digital signal, the clock will immediately self–correct. The secondary clock shall have the ability to accept sync–wire communication protocols with hourly and daily correction. The secondary clock is to have a microprocessor based movement. The clock shall have a low–profile, semi–flush smooth surface metal case. The crystal will be shatterproof polycarbonate material. Glass and visible molding marks are unacceptable. The clocks will be able to be mounted to a standard single gang box. The clock is to have black hour and minute hands, as well as a red second hand. The clock shall have UL, cUL and FCC compliance.

Accessories: Page 77

## Specifications

| | |
|---|---|
| Time Base: | 50/60 Hz (automatic frequency detection, three (3) wire system) |
| Voltage Input: | 85—135 VAC / 60 Hz<br>7—28 VAC / 60 Hz |
| Average Current Consumption: | 20 mA @ 110 VAC<br>15 mA @ 24 VAC |
| Correction Current Consumption: | 10 mA |
| Display: | 12 or 24 hour format |
| Color: | Standard black or white (custom colors available) |
| Clock Size: | 12.81″ diameter, 1.2″ depth<br>16.81″ diameter, 1.6″ depth |
| Dial: | Durable polystyrene material |
| Case: | Shallow profile, smooth surface metal case (optional ABS case available) |
| Crystal: | Shatterproof, side molded polycarbonate crystal |
| Hand Tolerance<br>  Hour and Minute Hand:<br>  Second Hand: | ± ¼ minute<br>± ½ second |
| Temperature Range<br>  Operating:<br>  Shelf: | 0°C—45°C<br>−15°C—75°C |
| Movement Dimensions: (L x W x D) | 2.93″ x 2.84″ x .937″ |
| Mounting Bracket Dimensions: (L x W x D) | 12″—12.56″ x 3″ x .04″<br>16″—16.38″ x 3″ x .04″ |
| Shipping Box Dimensions: (L x W x D) | 12″—15″ x 16.25″ x 2.5″<br>16″—18″ x 19.25″ x 3.5″ |
| Shipping Weight: | 12″—4 lbs.<br>16″—6 lbs. |
| Power Kit Includes: | 1—5 pin power harness (18 AWG)<br>1—ground wire (18 AWG)<br>1—10–12 blue plastic anchor<br>1—sheet metal screw 10 x 1.5<br>2—machine screws 6–32 x ½<br>2—4mm thread, 10mm length screw |
| Compliance: | UL, cUL listed and FCC approved |

## Mechanical Drawing



**Single Mount**

12″ H= 8.75
16″ H= 10.81

**Double Mount**
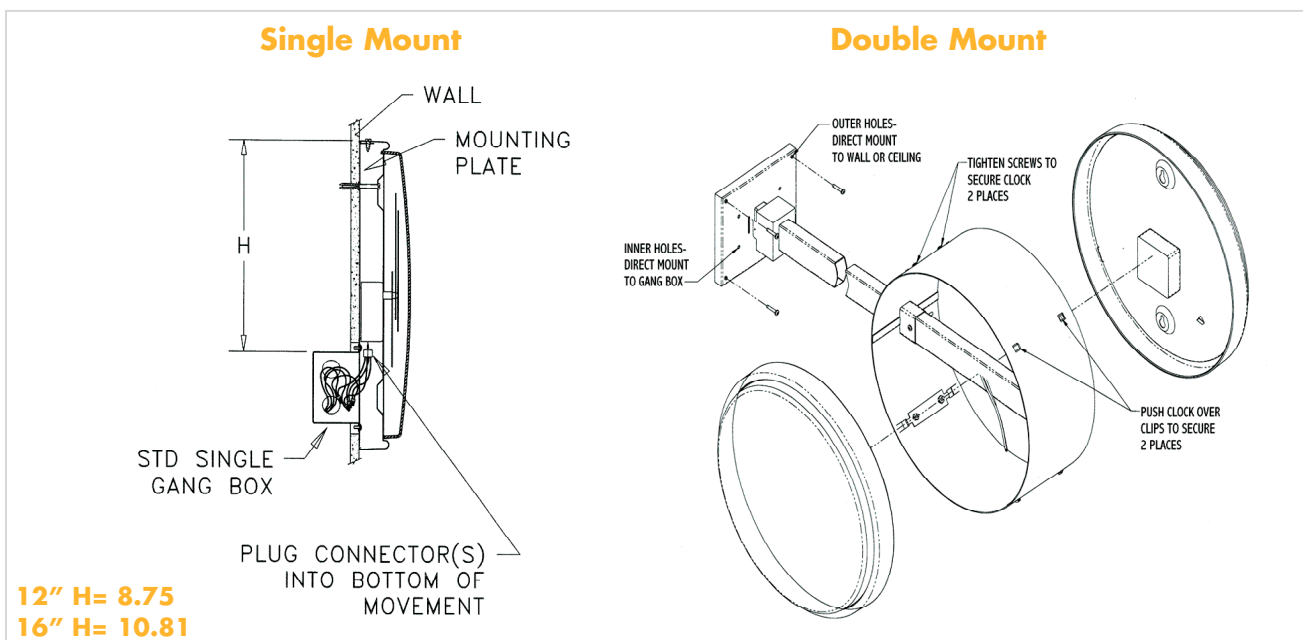
## Hands Options

STANDARD CHOICE | CUSTOM CHOICES
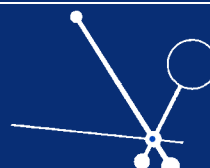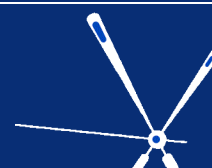
Style 1 | Style A | Style B | Style C | Style D

## Dial Options

STANDARD CHOICE | CUSTOM CHOICES
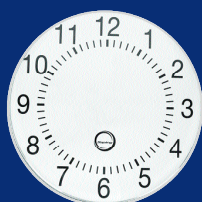
12 Hour
Style 1
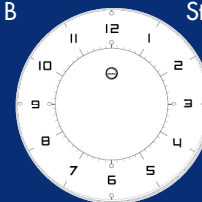
24 Hour
Style 2
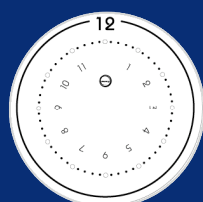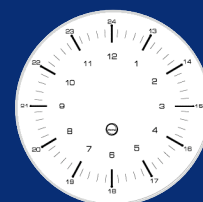
Style A | Style B | Style C
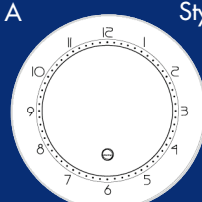
Style D | Style E

## Color Options

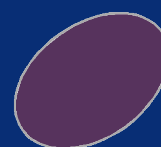STANDARD CHOICE | CUSTOM CHOICES

Black
Style 1

White
Style 2

#645
Style A

#188
Style B

#281
Style C

#519
Style D

#166
Style E

## Ordering Information

**Analog Clock**

### SAM–ACS–ZZR–VHD

| A=Case | C=Color | ZZ=Clock Size | V=Voltage | H=Hands | D=Dial |
|--------|---------|---------------|-----------|---------|--------|
| 1=Metal | 1=Black | 12=12" | 1=110V | See chart | See chart |
| 2=Plastic | 2=White | 16=16" | 50/60 Hz | Style 1 | Style 1 or 2 |
| | Other= | | 4=24V | Style A–D | Style A–E |
| | (see chart) | | 50/60 Hz | | |

Options:

Additional Power Kits: 12": A–PK–12–2A or 16": A–PK–16–2A
Additional Mounting Brackets: 12": M–MB–12–4 or 16": M–MB–16–2
Surface Mount Ring: 12": A–MOUNT–12S–1 or 16": A–MOUNT–16S–1
                    (See page 79)
Universal Mounting Bracket: M–UMB–12–1 (See page 79)
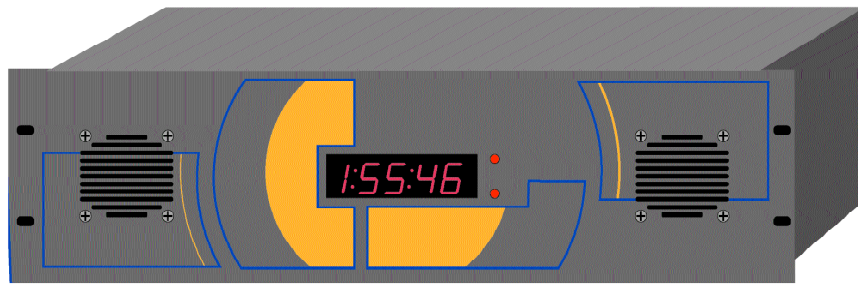
**Double Mount Bracket**

### SAB–1CD–ZZR–0L

| C=Color | ZZ=Clock Size | L=Pole Length |
|---------|---------------|---------------|
| 1=Black | 12=12" | Standard: 04=4" |
| 2=White | 16=16" | Optional: 12=12" |
| Other= | | 24=24" |
| (see chart) | | 36=36" |
| | | 48=48" |

Example:

SAB–1BD–12R–024: 12" Double Mount Bracket, Black, 24" Length
SAB–1BD–16R–036: 16" Double Mount Bracket, Black, 36" Length
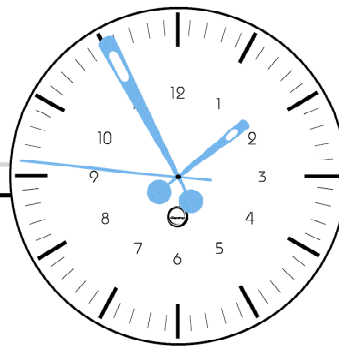
SAM Series Smart Clock

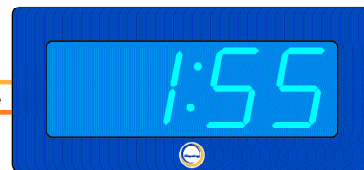# 2 Wire Digital Communication



20  21

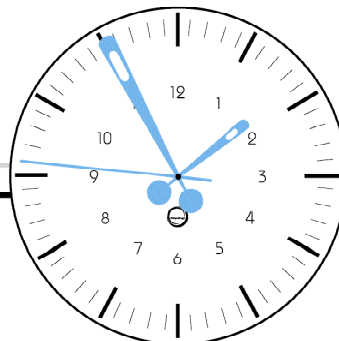**SSM Series Master Clock**
with Converter Option
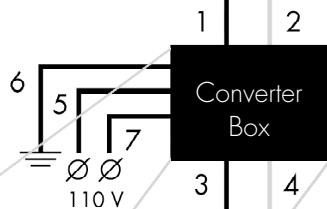
White
Black

24 V  SAM Series Analog Clock

Yellow
Orange

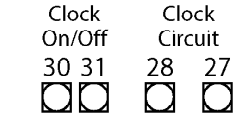24 V SBD 1000 Series Digital Clock
or
SBD 2000 Series Digital Clock

1    2

6
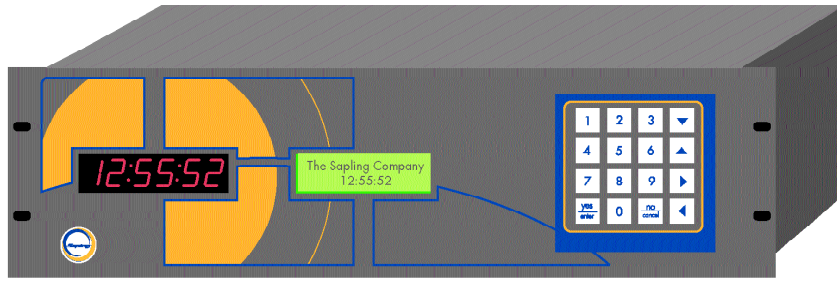5
7

Converter
Box

∅  ∅
110 V

3    4

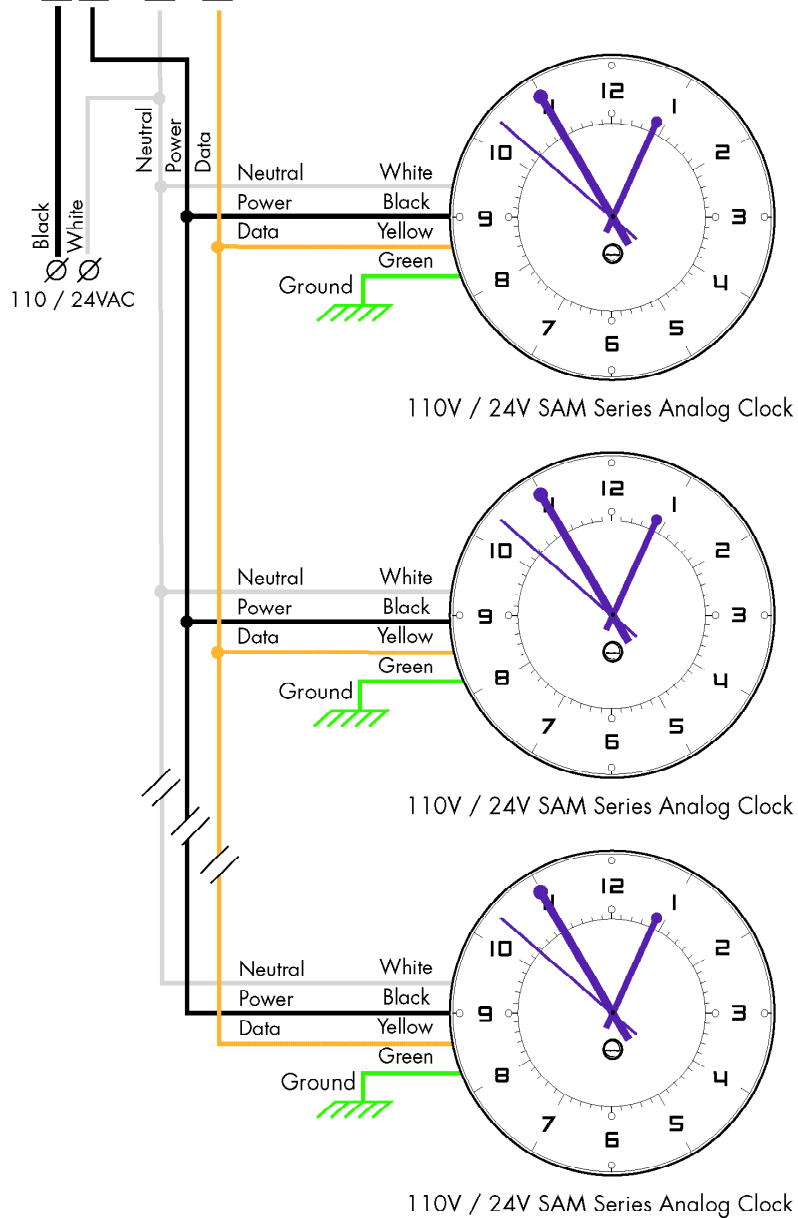White
Black

24 V  SAM Series Analog Clock

Option:

Converter Box
**SCB–000–000–1**
(5.5A Output)

# 3 Wire Digital Communication



SMC Series Master Clock
Requires: SMC—000—010—1
Power Supply

Clock On/Off   Clock Circuit
30  31   28  27

Neutral  Power  Data

Black  White

110 / 24VAC

Neutral — White
Power — Black
Data — Yellow
— Green
Ground

110V / 24V SAM Series Analog Clock

Neutral — White
Power — Black
Data — Yellow
— Green
Ground

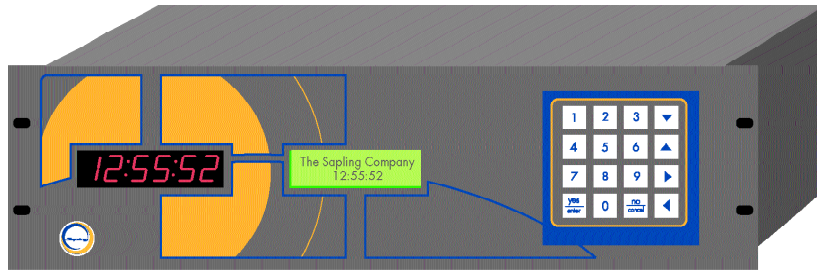110V / 24V SAM Series Analog Clock

Neutral — White
Power — Black
Data — Yellow
— Green
Ground

110V / 24V SAM Series Analog Clock

**
If a transformer is needed for a 24 volt system, please select from the following:

Part Number:
**35–M015** (6.2A)
**35–M020** (10.4A)
**35–M025** (20.8A)
**35–M030** (31.2A)

# Sync Wire Communication

**SMC Series Master Clock**

Clock On/Off  Clock Circuit

33  34  or

30  31  36  37

Neutral
Power
Reset

Black
White

110 / 24 VAC

Neutral — White
Power — Black
Reset — Yellow
Green
Ground
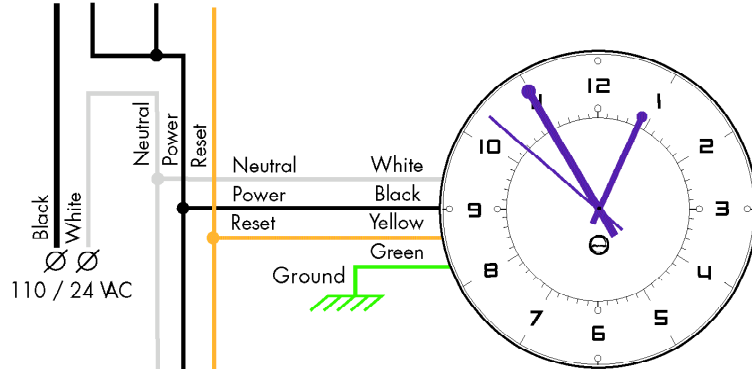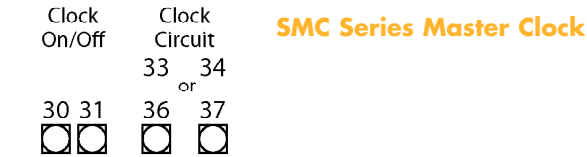
**110V / 24V SAM Series Analog Clock**

*
Please note the following:

**For 110V model:**
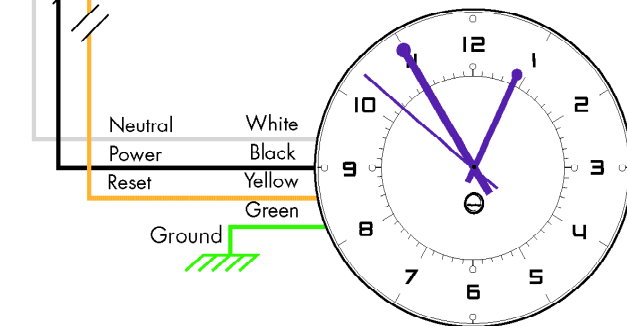Connect the black and white wires from the 5 pin harness on the digital clock to power and neutral.

**For 24V model:**
Connect the orange and yellow wires from the 5 pin harness on the digital clock to power and neutral.

Neutral — Orange
Reset — Yellow
Power — Power
Neutral — Neutral
Green
Ground

Correction
Power
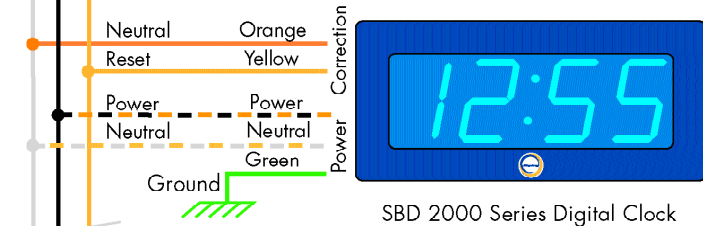
**SBD 2000 Series Digital Clock**

**
If a transformer is needed for a 24 volt system, please select from the following:

Part Number:
**35–M015** (6.2A)
**35–M020** (10.4A)
**35–M025** (20.8A)
**35–M030** (31.2A)

Neutral — White
Power — Black
Reset — Yellow
Green
Ground

**110V / 24V SAM Series Analog Clock**