ANC - 7020 Series
RS-485/RS-422 Synchronous Clock Display

Antona

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♦ Dim/brightness control
♦ Low power consumption and long life LED display
♦ Synchronized multiclock operation
♦ RS-422/RS-485 Interface for noise immune communication
♦ Leading zero suppression option
♦ Serial receive colon blink option

Overview

The ANC-7020 series large format synchronous clock display decodes an RS485 or RS422 noise immune serial signal to remotely display time-of-day information.

Mechanical Specifications

Clock case size: 5.0"H X 13.5"W
Clock display size: 4.0"H X 11.5"W
Weight: 2 pounds
Connectors: 6-pin RJ-11 modular phone jack with loop through
                               2.1mm Barrel connector for +5V DC power to unit (center pos.)

Electrical Specifications

Power requirements = 180 ma for full brightness and all LEDs on
                                 150 ma for display at full brightness and normal time display
                                  30 ma for display at dimmest setting and normal time display
                                  20 ma for display off (0/16 brightness setting)

RS-422/485 input   = short proof input, non-terminated operation to 150 feet,
                                 terminated operation to 4,000 feet.

Installation

Turn off the ANC-7030 controller chassis before connecting the clock or external power is connected to the clock display. ***Never install or remove the clock display with the power applied to the controller chassis or any other attached clock or equipment. This could result in permanent damage to the clock due to static discharge.***
Normally the clock is plugged directly into the serial port RJ-11 converter adapter which plugs into the male DB-9 jack on the back of the chassis under the connector labeled "CLOCK. The RJ-11 to male DB-9 converter would be impossible to plug in to the wrong DB-9 (marquee DB-9 connector is female), but the marquee and clock connectors are both RJ-11s. The user should screw the 2 mounting screws into the serial port's DB-9 hex nuts for permanent installation to assure good long-term connection

Serial Port Interface

The clock contains a double buffered UART (universal asynchronous receiver transmitter) that will decode a fixed format message at 2400 Baud, 8-data bits, no parity and 1-stop bit. The physical interface is both RS422 and RS485 compatible providing differential noise immune operation at up to a 4,000 foot distance. Currently, 8 clock addresses are supported, but up 32 clocks can be driven with from the ANC-7030. The current version of software in the ANC-7030 controller sends out dim/brightness data to clocks 0,1,2 and 3 only to reduce the refresh cycle at each clock to 4-seconds. See appendix A for the protocol of the serial data.

Clock Display and Error Messages

Most of the time the four LED digits will display time-of-day in 24-hour format. At midnight, the display rolls over from "23:59" to "00:00". All ANC-7020 clock displays connected to the ANC-7030 controller will update the time change to the display simultaneously on the minute.

If there is no clock signal being received, the clock will display "**Sync**" to indicate that no-*sync*hronization time signal has been received in 1.1 second. Check that the power is on at the ANC-7030 clock controller unit, and that the RJ-11 connector cable in the back of the chassis is plugged into the adapter over the DB-9 labeled "CLOCK". If that does not solve the problem, check the individual cable runs into and out of each clock.

A display of "**3?:??**" indicates that time data is being received, the data is just not in range (over 23:59). This could be caused by a failure on the ANC-7332 clock I/O card due to a real time clock chip failure or the clock I/O card (ANC-7332). Most likely, the battery that runs the clock chip in the ANC-7030 chassis when power is off, has been exhausted, and should be replaced (and the time reset from the front panel).

Clock Jumper Options

Before opening the clock case remove power to the enclosure by pulling the left hand lower side barrel connector from the aluminum case. To open the enclosure to change jumper options use a small flat blade screwdriver and carefully remove the 4 black nylon screws from the corners of the front blue plastic filter. *The plastic filter will only go on one way so note side and orientation when the filter is removed for easiest reassembly when finished*. To change jumper options near the microprocessor, remove the 10s of hour digit by carefully pulling up on the digit and removing it from the aluminum clock case.

Reassemble the enclosure by first reinstalling the 10s of hour digit (if removed) by lining up the gold pins on the clock motherboard with the mating black receptacle on the 5X7 LED display along the vertically running 7-pin single inline connector. Once the vertical connector is seated, press down on the 5X7 matrix along the top of the display to seat the horizontally running 7-pin connector. Plug power back into the clock at this point to insure that the 10s digit is operating correctly, and that any jumper options changed are working. Lastly, use the black nylon screws to replace the front blue plastic panel. The black nylon screws should _easily_ reassemble if the blue plastic filter is oriented properly.

Software Options

  This group of jumpers sets the clock address from 0 to 7 and sets how the time data is displayed. Jumpers 1,2 and 3 set the clock address as shown in table 2 below. Option jumper 6 enables a 20 ms wink in the colon to indicate that a correct data block has been received and processed. When jumper 7 is installed, the 10s of hour digit is blanked when a time-of-day display is less than "10:00". When enabled, this would display " 6:00" on the unit instead of "06:00". *Jumpers 6 and 7 are not installed when shipped unless the customer has requested such options.*
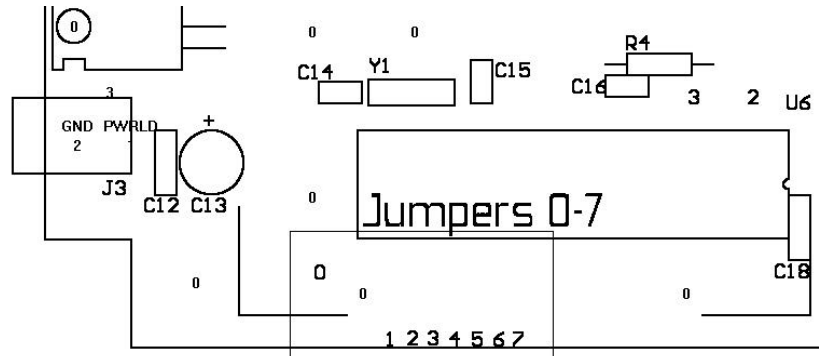

Figure 1

Jumper pin #	Function (shunt on)
0	-not used-
1	Address bit 0
2	Address bit 1
3	Address bit 2
4	-not used-
5	-not used-
6	Blink Colon on input
7	Leading zero Suppression

Table 1

Clock Address	Jump 1	Jump 2	Jump 3
0	open	Open	Open
1	Shorted	Open	Open
2	Open	Shorted	Open
3	Shorted	Shorted	Open
4	Open	Open	Shorted
5	Shorted	Open	Shorted
6	Open	Shorted	Shorted
7	Shorted	Shorted	shorted

Table 2

Clock Serial Interface Termination

For cable lengths greater than 150 feet, resister termination across the receive pair end of the cable may be necessary. There are two jumpers within the clock enclosure to enable a 150-ohm resister across the receiver lines to the differential interface**. These jumpers should be installed onto both pins of the last clock in the chain**. The jumpers are located just below the two 6-pin modular RJ-11 receptacles as shown below:
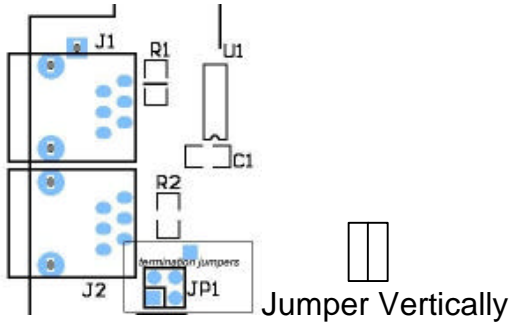

Jumper Vertically

Figure 2

Install the jumpers vertically across the 4 pins at the "JP1" site to place the 150-ohm resister in parallel with the receive data lines. Only one clock, the last or only, in the chain should have this option installed. Without removing the front blue plastic panel, the user can see if these jumpers have been installed across the two jumper pins.

External connections to ANC-7020

There are three external connectors on the left-hand side panel of the display. Two of the connectors are 6-pin RJ-11 modular phone type receptacles. *All 6 contacts are connected in parallel on each connector*. This means that either receptacle may be used to input the drive signal and 'loop through' another cable to chain together up to 32 clocks. The current ANC-7030 software version supports 4 clocks with dim/bright control information being transmitted, but you can add or use the same clock address to add up to 32 remote reading clocks without additional drive buffering. All clocks set for a specific address will be set for the same dim/brightness.

RS422/RS485 Signals

Function	RJ-11 Pin #	Comment	Data Direction
Ground	1	Signal Ground	I/O signal ground
+Tx	2	+ transmit data	Output from clock
-Rc	3	- receive data	Input to clock
+Rc	4	+ receive data	Input to clock
-Tx	5	- transmit data	Output from clock
Ground	6	Signal Ground	I/O signal ground

Power Supply Connector

The third connector is a 2.1mm barrel type connector to supply the +5V DC required by the clock. The current requirement is 200 ma and the center conductor of the barrel connector is plus voltage (+5v). Use the supplied external wall-type DC source to plug into this connector. For an overall brighter display at all brightness settings, up to a +9V DC power supply may be used. An internal +5V regulator handles the step down for the microcontroller and associated circuitry when the applied DC voltage is higher than +5V.

Appendix A - Clock Protocol

The RS422 serial output to the remote mounted clock(s) is fixed at 2400 Baud, 8 data bits, one stop bit and no parity. Transmission of time-of-day to all clocks is synchronized at 1-second intervals. Individual brightness settings are transmitted addressed to each clock 1/2 second after a time-of-day transmission. Data, whether time or control information is fixed at 6 bytes as follows:

Byte #	Description
1	Sync Code (CCH)
2	Unit Address - 00H to 08H (All=80H)
3	Control Code*
4	Data byte 1 (hours/brightness)
5	Data byte 2 (minutes)
6	Checksum - sum of bytes 2-5 modulo 8, 1's compliment

 * - the control codes are as follows:

21H = set clock time of day with bytes 4/5 (packed BCD)

20H = set clock brightness with byte 4 lower nibble (binary)

31H = set clock test LED mode - turns all LEDs on

A typical serial transmission of time data would be as follows:
```
CCH 80H 21H 12H 34H 0AH
```

This would display "12:34" on the ANC-7020.

Appendix B -Circuit Board Schematic

The following page(s) contain the schematic for the series 7020 time of day clock display. The schematic and card artwork are copyright protected by Antona Corporation and are included only to aid the end user to configure the adapter or for competent technical service personnel to use in maintenance or repair.

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LED MATRIX DRIVE

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