FN:GPSTR3MAN1.PDF

GPS-TR3

GPS MASTER CLOCK INTERFACE

APPLIED TECHNICAL SYSTEMS

GPS-TR3 GPS MASTER CLOCK INTERFACE
REV 09/30/04

DESCRIPTION

The GPS-TR3 Master Clock Interface provides an accurate Time Reference for all types of master clock systems.

The GPS-TR3 is a two-part system which includes the GPS-427A Antenna/Receiver, and the TR3 GPS Master Clock Interface.

This system easily interfaces by dry contact or serial data to most master clocks, time systems, or computers.

SPECIFICATIONS

GPS-427A Antenna/Receiver

Functions:	Receives NMEA sentences from the GPS Satelites and sends them to the TR3 Interface.
Power:	Power is 12 VDC, 50 mA max. Power is provided by TR3
Wiring:	Clearly label terminal blocks inside the enclosure. Requires simple 3-conductor cable (Belden 8443 or equivalent). Can be mounted up to 1000 feet from the TR3.
Enclosure:	Weatherproof NEMA 4X Plastic Enclosure for outdoor installation. Must be located in order to see the Southern sky. Measures 4.5”W x 4.5”H x 3.5”D.

TR3 Master Clock Interface

Display:	16 character alpha-numeric display shows local time and GPS status.
Functions:	Extracts accurate time and date information, and satellite status from the NMEA sentences sent from the GPS-427A Antenna/Receiver. Provides a programmed contact closure output (relay) or serial data for synchronizing master clocks and other time system components.
Setup:	Rotary selector switches are included inside the TR3 for initial setup. Setup includes selecting the local time zone and the synchronization output required. DST (according to U.S. DST rules) is selected by default. A jumper is used to select NO DST.
Relay Output	SPDT relay rated at 15 Amps at 48 VAC or 30 VDC
Serial Data Output:	ATS 10 byte serial data messages are provided for controlling ATS digital clocks and displays, time zone clocks, and master clocks.
Dual Power:	Power is 12 VAC, 50/60 HZ, or 12VDC – 100 mA max. A 120 VAC power module is provided for 120 VAC operation. Also, the TR3 provides power to the GPS-427A Antenna/Receiver
Wiring:	Clearly label terminal blocks inside the enclosure.
Enclosure:	Painted aluminum enclosure measures 3.7”W x 7.6”H x 1.55”D.

INSTALLATION

MOUNTING THE GPS ANTENNA/RECEIVER

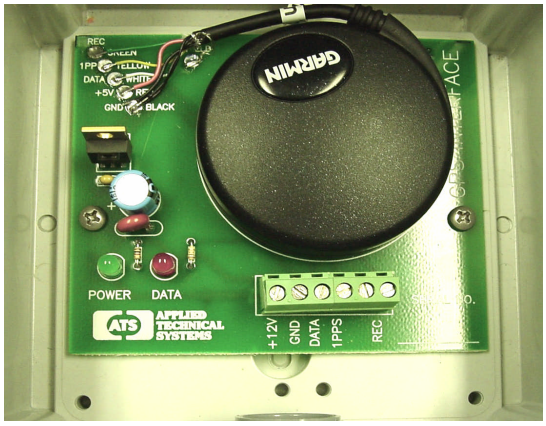
The GPS-427A Antenna/Receiver is typically mounted outdoors where it can have a clear view of the sky. This can be on the side of a building or on a rooftop as required. Mounting holes and a short piece of conduit are provided. Refer to the GPS-427A drawing at the back of this manual for additional installation information.

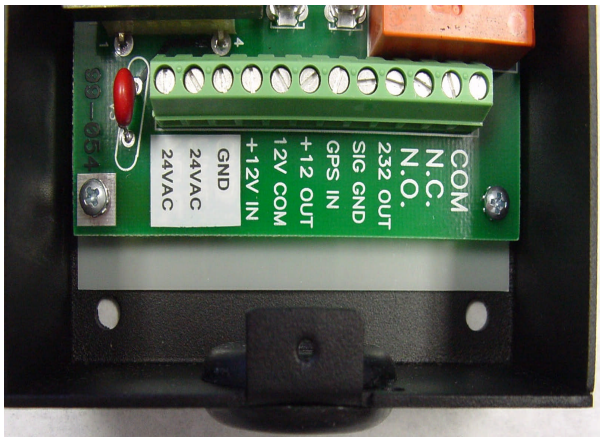
MOUNTING THE TR3 MASTER CLOCK INTERFACE

The TR3 Master Clock Interface should be mounted for easy wiring to the master clock and antenna/receiver. Mounting holes are provided for easy mounting to a wall or panel.

WIRING

Connecting to the Antenna/Receiver





Three-conductor cable is required. Recommended cable: Belden #8443 or equivalent. Do not use shielded cable. Remove power from the TR3, and wire as follows:

	GPS-427A		TR3
From	+12V	to	+12 OUT
From	GND	to	12V COM
From	DATA	to	GPS IN

See sample wiring diagrams at the back of this manual.

Connecting the 24 VAC Power Module

Connect the two-stripped leads from the power module to the two terminals labeled 24VAC.

Refer to the wiring diagrams for more detail.

Connecting to the relay output

Typically the relay output is connected to a synchronization input of another master clock or system to provide a contact closure at a specified hour (usually Midnight), or for a contact closure each minute. Usually these are a low voltage, low current inputs. Use the C and NO terminals to switch your control voltage, or logic to common signal to your specific device. See sample wiring diagrams at the back of this manual.

For control of 59th minute corrective clocks, the relay can be connected to the 24 VAC correction line feeding your system of 24 VAC corrective clocks. Use the C and NO terminals to switch your 24 VAC control voltage. Keep in mind the 15 Amp rating on the TR3's built-in relay output. It is good practice to use an interposing relay for this application to minimize the wear on the built-in relay. See sample wiring diagrams at the back of this manual.

For 120 VAC corrective clocks always use an interposing relay with a 24 VAC coil.

See sample wiring diagrams at the back of this manual.

Connecting to the serial data output (232 OUT)

A two-conductor cable is required for connecting the serial data output to all remote devices. The recommended cable is Belden #8442 or equivalent. Do not use shielded cable. The remote device or devices must be able to receive and decode the 10-Byte messages sent from the TR3. Connect the out going two-wire cable to the terminals labeled 232 OUT and SIG GND.

TR3 Terminal	AE/CC Device	Computer
232 OUT	WH/OR Wire (RCV) RCV Terminal	DB9 Connector Pin
SIG GND	BLK/RED Wire (COM) COM Terminal	DB9 Connector Pin 5

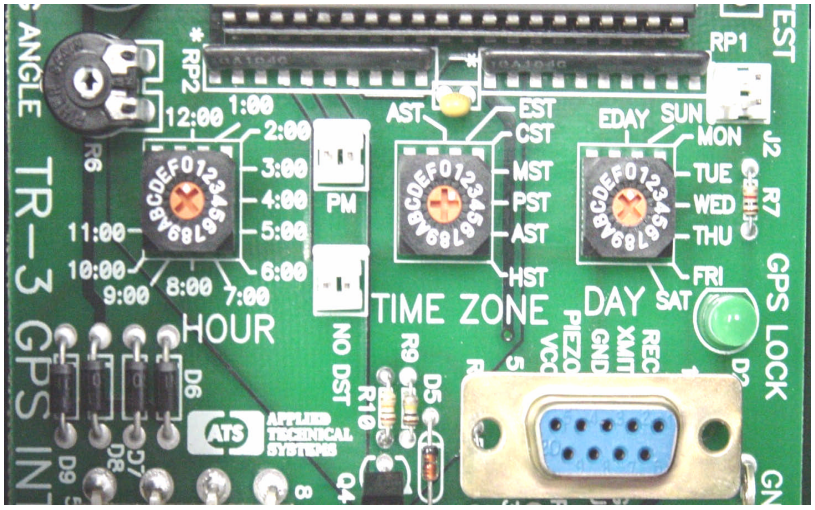
See sample wiring diagrams at the back of this manual.

SETUP

There are three rotary selector switches located on the PCB assembly.

Remove power from the TR3.

Remove the TR3 cover to gain access to the selector switches.



Time Zone Selector Switch

Set the local Time Zone selector switch to your local time zone. Choices are:

AST	Position 0	Atlantic Standard Time
EST	Position 1	Eastern Standard Time
CST	Position 2	Central Standard Time
MST	Position 3	Mountain Standard Time
PST	Position 4	Pacific Standard Time
AST	Position 5	Alaska Standard Time
HST	Position 6	Hawaii Standard Time

If your local zone does not use Daylight Savings Time (U.S. DST rules), install the NO DST jumper (also located on the PCB assembly).

Hour Selector Switch

Use the Hour selector switch to select the desired relay output program. Choices are:

12:00	position 0	Closes the relay for 2 seconds at 12:00 AM
1:00	position 1	Closes the relay for 2 seconds at 1:00 AM
2:00	position 2	Closes the relay for 2 seconds at 2:00 AM
3:00	position 3	Closes the relay for 2 seconds at 3:00 AM
4:00	position 4	Closes the relay for 2 seconds at 4:00 AM
5:00	position 5	Closes the relay for 2 seconds at 5:00 AM

6:00	position 6	Closes the relay for 2 seconds at 6:00 AM
7:00	position 7	Closes the relay for 2 seconds at 7:00 AM
8:00	position 8	Closes the relay for 2 seconds at 8:00 AM
9:00	position 9	Closes the relay for 2 seconds at 9:00 AM
10:00	position A	Closes the relay for 2 seconds at 10:00 AM
11:00	position B	Closes the relay for 2 seconds at 11:00 AM

Install the PM jumper to change all the above times to PM

The Hour selector switch is ignored if 59th minute correction is selected using the Day selector switch..

Day Selector Switch

Use the Day selector switch to select the desired day of the week to on which to operate the relay. Usually this is set for EDY meaning everyday of the week. Choices are:

EDY	position 0	Performs the selected relay function everyday
SUN	position 1	Performs the selected relay function on Sunday, only
MON	position 2	Performs the selected relay function on Monday, only
TUE	position 3	Performs the selected relay function on Tuesday, only
WED	position 4	Performs the selected relay function on Wednesday, only
THU	position 5	Performs the selected relay function on Thursday, only
FRI	position 6	Performs the selected relay function on Friday, only
SAT	position 7	Performs the selected relay function on Saturday, only

59th Minute Correction (Day Selector Switch)

The relay can be programmed to automatically to provide contact closures according to the 59th minute correction requirements. Use the Day selector switch to select the 59th minute correction as follows:

position C 59th minute correction

59th Minute correction occurs all seven days of the week. An (8) second relay closure occurs each hour at the 57th minute and 54th second (XX:57:54). At 5:57:54 (AM and PM) the relay closure is extended an additional 6 seconds for a total of (14) seconds.

RS 232 Serial Data Output

There is no setup required for the serial data output.

The RS232 output can be connected to ATS AE and CC Series remote devices such as digital clocks, time zone clocks, and displays. It can also be connected to a computer for special applications.

A series of 10-Byte messages is transmitted via the RS232 output to the remote devices. The remote device will be set up to received specific 10-Byte messages, ignoring all others.

The following 10-Byte messages are sent:

Address 1	Time Zone 1	EASTERN, -5
Address 2	Time Zone 2	CENTRAL, -6
Address 3	Time Zone 3	MOUNTAIN, -7
Address 4	Time Zone 4	PACIFIC, -8
Address 5	Time Zone 5	ALASKA, -9
Address 6	Time Zone 6	HAWAII, –10 NO DST
Address 7	Time Zone 7	
Address 8	Time Zone 8	
Address 9	Time Zone 9	TOKYO, +9 NO DST
Address 10	Time Zone 10	
Address 11	Time Zone 11	
Address 12	Day of the week and Julian Date – Local Time Zone	
Address 13	Date – Local Time Zone	
Address 14	Time – GMT (Zulu) - NO DST	
Address 15	Time - Local Time Zone	

All time zone time displays are in 24–Hour Format, only.

OPERATION

Before applying power, be sure all wiring is completed. Apply power to the unit. The display will show a version number:

TR-3 Ver 3.00

After a few seconds the display will show the following message:

Acquiring Sats.

If the GPS-427A Antenna/Receiver is connected, the period after “Sats” will flash indicating that data is being received. This message will remain until the TR3 is locked on to at least 3 satellites. When locked on the day/time display will appear.

Mon 12:34:56 PM

Once the day/time display appears, all programmed outputs will be enabled.

It is not unusual to lose the GPS signal intermittently depending on clouds or other temporary obstructions. When the signal is lost, the TR3 will display the “Acquiring Sats.” Message, and the programmed outputs will be disabled. Be sure to position the GPS-427A for a clear unobstructed view of the sky (Southern sky for Northern Hemisphere, Northern sky for Southern Hemisphere) for best results.

TECHNICAL SUPPORT

For any questions concerning installation and operation of this product, contact our factory at:

PHONE (800) 444-7161
OR
FAX (318) 797-4864

SERVICE POLICY

It is recommended that all service for this product be done by the factory or by a factory authorized service representative. Applied Technical Systems will provide ongoing service support in and out of warranty. Send your repairs to:

APPLIED TECHNICAL SYSTEMS
849 KING PLACE
SHREVEPORT, LA 71115

APPLIED TECHNICAL SYSTEMS WARRANTY POLICY

ATS warrants its products to be free of defects in material and workmanship for a period of 24 months from the date of purchase. ATS will repair or replace any product returned to its authorized factory service center within the warranty period so long as there is no evidence that the product has been abused, misused, damaged by lightning, overloads of any kind or water, or altered in any way.

Products returned for warranty must be returned with freight prepaid. ATS will pay normal freight charges to return the product to the customer. Special premium freight requested by the customer will be charged to the customer.

ATS disclaims any warranties expressed or implied, including merchantability and/or fitness for a particular purpose. In no event shall ATS be held liable for incidental or consequential damages.

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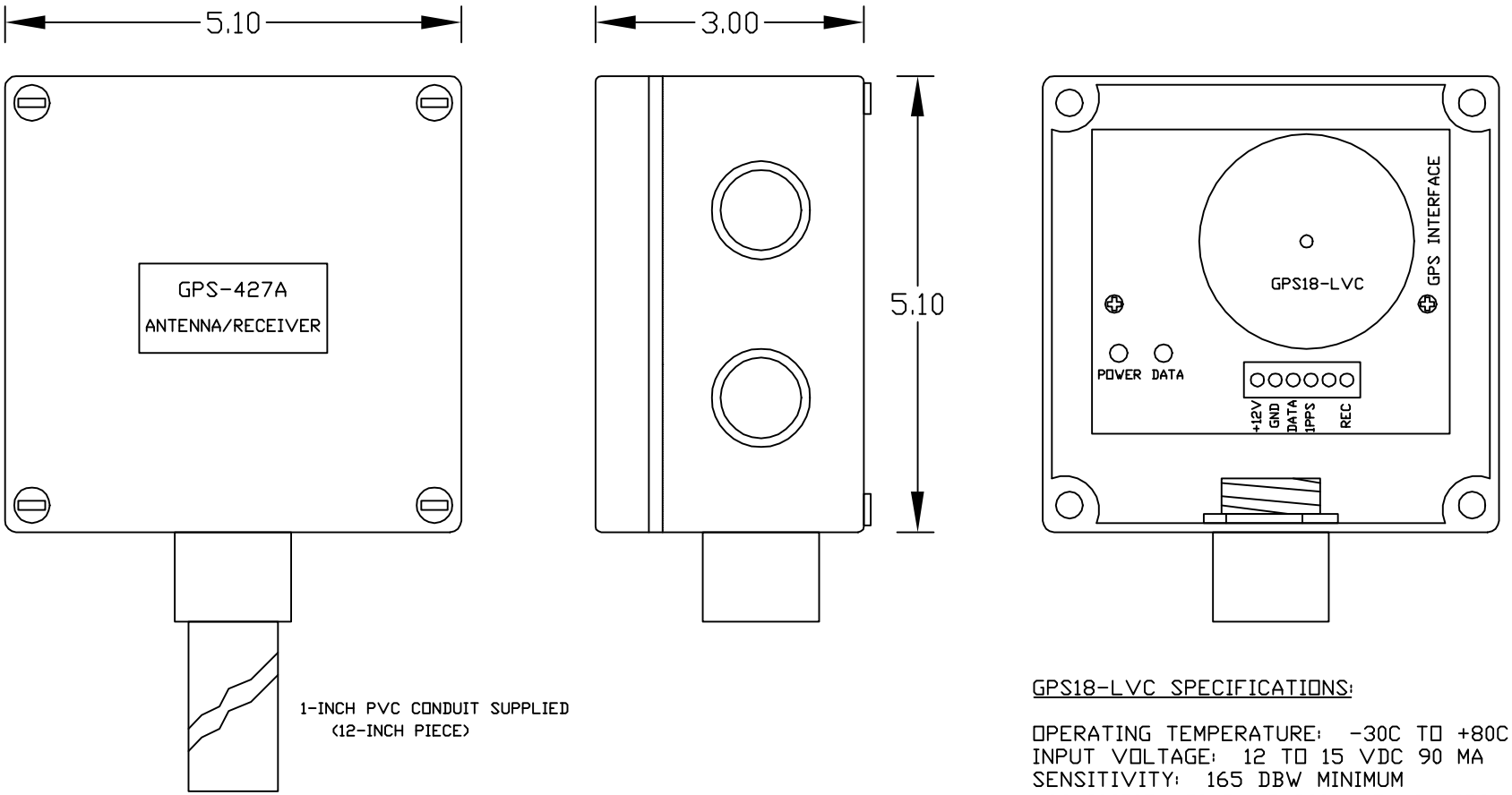

GPS-427A ANTENNA/RECEIVER SYSTEM HAS A BUILT-IN GPS RECEIVER THAT OUTPUTS NMEA DATA VIA RS232 AT 2400 BAUD.

WEATHERPROOF ENCLOSURE IS NEMA 4X PLASTIC WITH PVC CONDUIT FITTING ON THE BOTTOM. A 12-INCH PIECE OF 1-INCH CONDUIT IS SUPPLIED.

MOUNTING - REQUIRES AN UNOBSTRUCTED VIEW OF THE SKY. MOUNTS HORIZONTAL OR VERTICAL. SCREW HOLES ARE PROVIDED IN ALL 4 CORNERS, OR USE CONDUIT PROVIDED. CAN BE MOUNTED UP TO 1000 FEET AWAY FROM MASTER CLOCK OR OTHER EQUIPMENT.

WIRING - REQUIRES 3-CONDUCTOR CABLE (BELDEN 8443 OR EQUIV). CONNECT 12 VDC POWER FROM MASTER CLOCK OR OTHER EQUIPMENT TO TERMINALS +12V AND GND. CONNECT THE DATA TERMINAL TO THE RECEIVE INPUT OF THE MASTER CLOCK OR OTHER EQUIPMENT. REFER TO THE INSTRUCTION MANUAL FOR THE SPECIFIC MASTER CLOCK OR OTHER EQUIPMENT FOR MORE DETAIL.

INDICATORS: "POWER" (GREEN LED) ON STEADY WHEN POWER IS APPLIED.
"DATA" (RED LED) FLASHES AT ~2 SEC. RATE AS DATA IS SENT.

GPS18-LVC SPECIFICATIONS:

OPERATING TEMPERATURE: -30C TO +80C
INPUT VOLTAGE: 12 TO 15 VDC 90 MA
SENSITIVITY: 165 DBW MINIMUM
ACQUISITION TIME: TYPICAL 5 MINUTES (NO DATA KNOWN)
OUTPUT: STANDARD NMEA0183 SENTENCES GPGGA, GPGSA GPGSV, GPRMC, GPVTG, PGRME, PGRMT.

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APPLIED TECHNICAL SYSTEMS
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DRAWN BY	
JNR	9/29/04

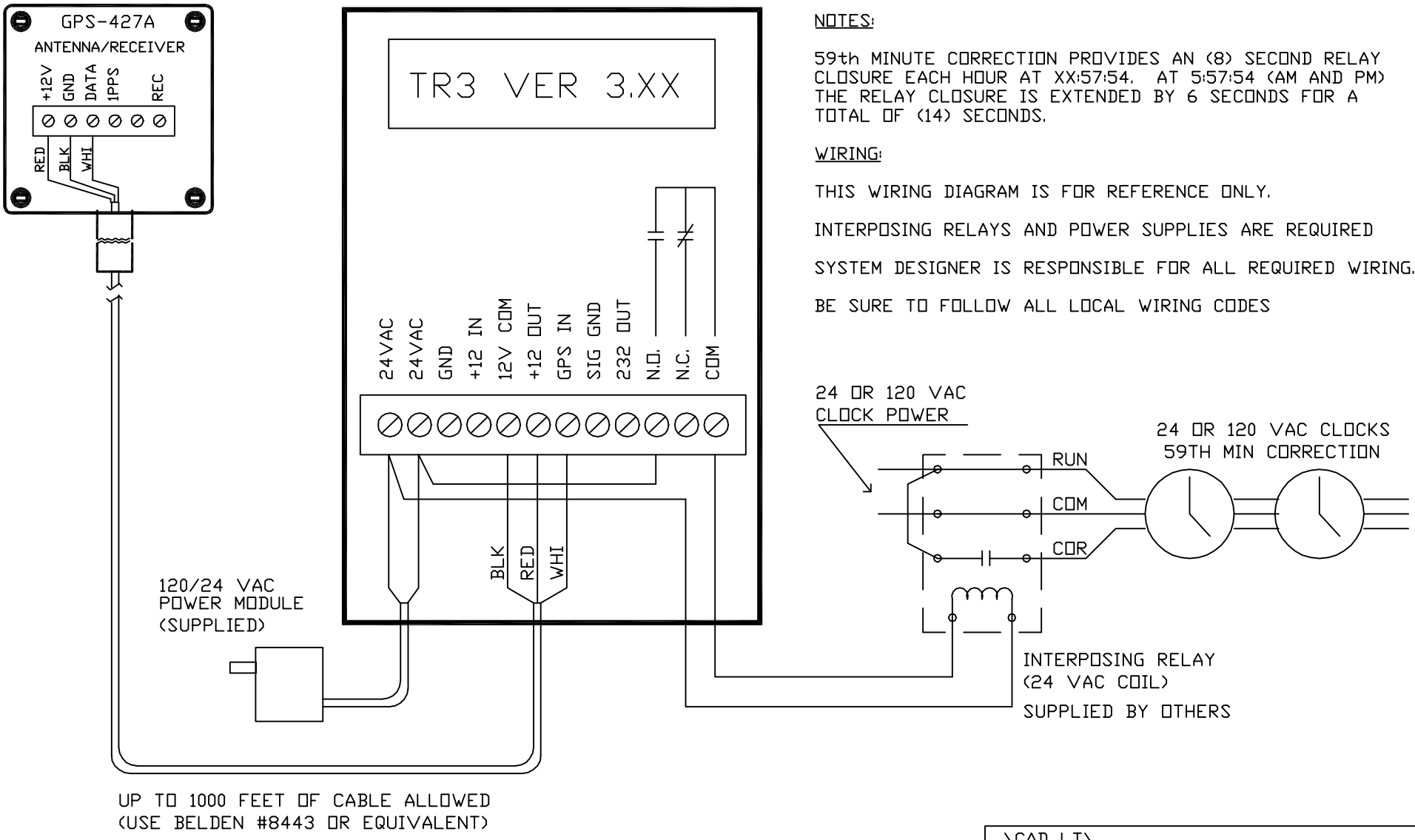
REVISIONS

PROJECT: GPS-427A ANTENNA/RECEIVER WITH GPS-18 LVC

DESCRIPTION: ASSEMBLY

SCALE: NONE
JOB #
SHEET #
REVISION
FILENAME: GPS427A-1
DRAWING #

PN PN HERE



NOTES:

59th MINUTE CORRECTION PROVIDES AN (8) SECOND RELAY CLOSURE EACH HOUR AT XX:57:54. AT 5:57:54 (AM AND PM) THE RELAY CLOSURE IS EXTENDED BY 6 SECONDS FOR A TOTAL OF (14) SECONDS.

WIRING:

THIS WIRING DIAGRAM IS FOR REFERENCE ONLY.

INTERPOSING RELAYS AND POWER SUPPLIES ARE REQUIRED

SYSTEM DESIGNER IS RESPONSIBLE FOR ALL REQUIRED WIRING.

BE SURE TO FOLLOW ALL LOCAL WIRING CODES

SET-UP:

SET THE DAY SELECTOR SWICH TO POSITION C.

REFER TO INSTRUCTION MANUAL FOR MORE DETAILS.

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REVISIONS

PROJECT: GPS-TR3 BASED CLOCK SYSTEM 59TH MIN CORRECTION

DESCRIPTION: WIRING DIAGRAM

SCALE: NONE

JOB #

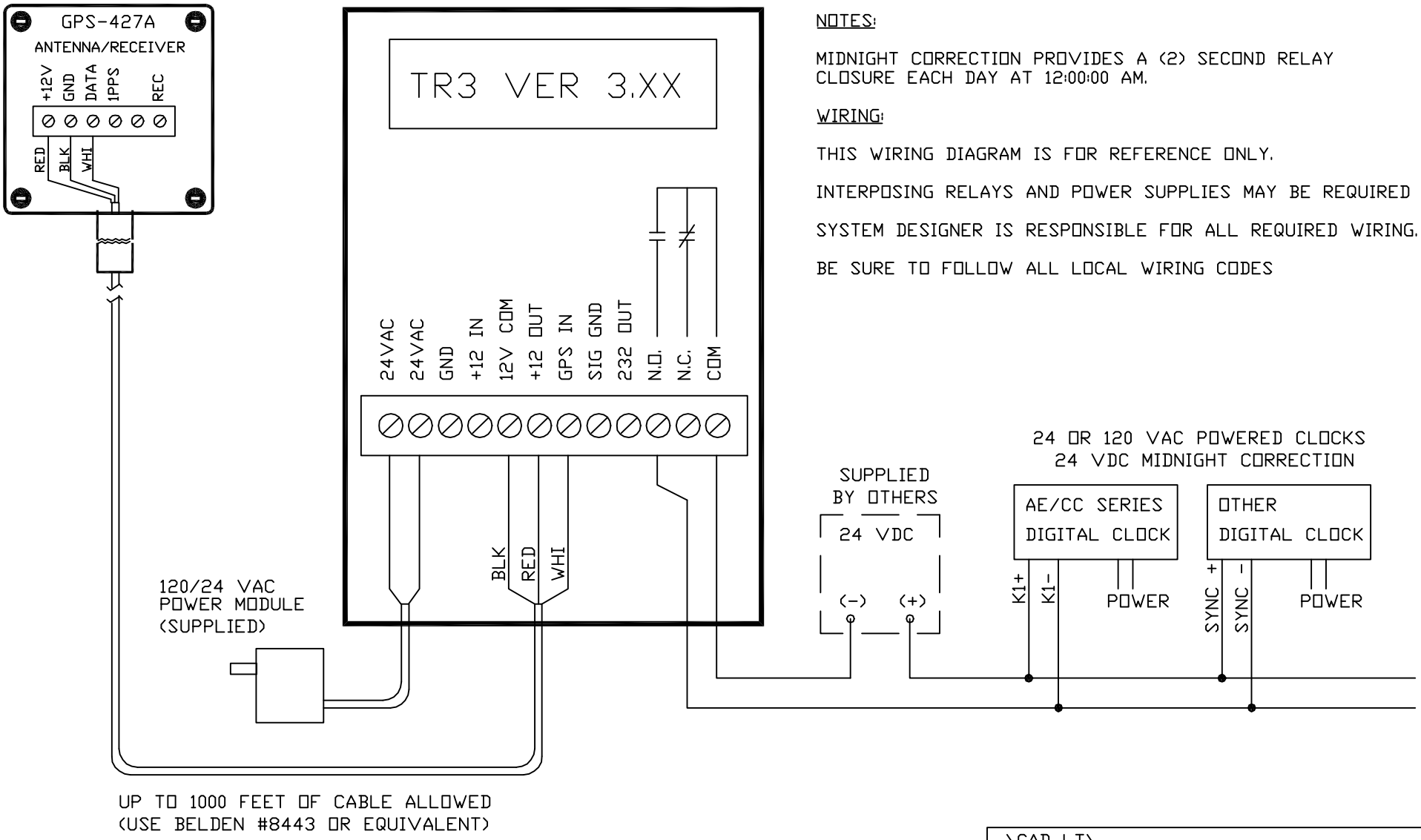
SHEET #

REVISION

FILENAME: TR3-WD1

DRAWING #

PN PN HERE



NOTES:

MIDNIGHT CORRECTION PROVIDES A (2) SECOND RELAY CLOSURE EACH DAY AT 12:00:00 AM.

WIRING:

THIS WIRING DIAGRAM IS FOR REFERENCE ONLY.

INTERPOSING RELAYS AND POWER SUPPLIES MAY BE REQUIRED

SYSTEM DESIGNER IS RESPONSIBLE FOR ALL REQUIRED WIRING.

BE SURE TO FOLLOW ALL LOCAL WIRING CODES

UP TO 1000 FEET OF CABLE ALLOWED
(USE BELDEN #8443 OR EQUIVALENT)

SET-UP:

SET THE HOUR SELECTOR SWITCH TO POSITION 0 (12:00).
DO NOT INSTALL THE PM JUMPER.
SET THE DAY SELECTOR SWITCH TO POSITION 0 (EDY)

REFER TO INSTRUCTION MANUAL FOR MORE DETAILS.

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PROJECT: GPS-TR3 BASED CLOCK SYSTEM MIDNIGHT CORRECTION

DESCRIPTION: WIRING DIAGRAM

SCALE: NONE
JOB #:
SHEET #:
REVISION:
FILENAME: TR3-WD2
DRAWING #:

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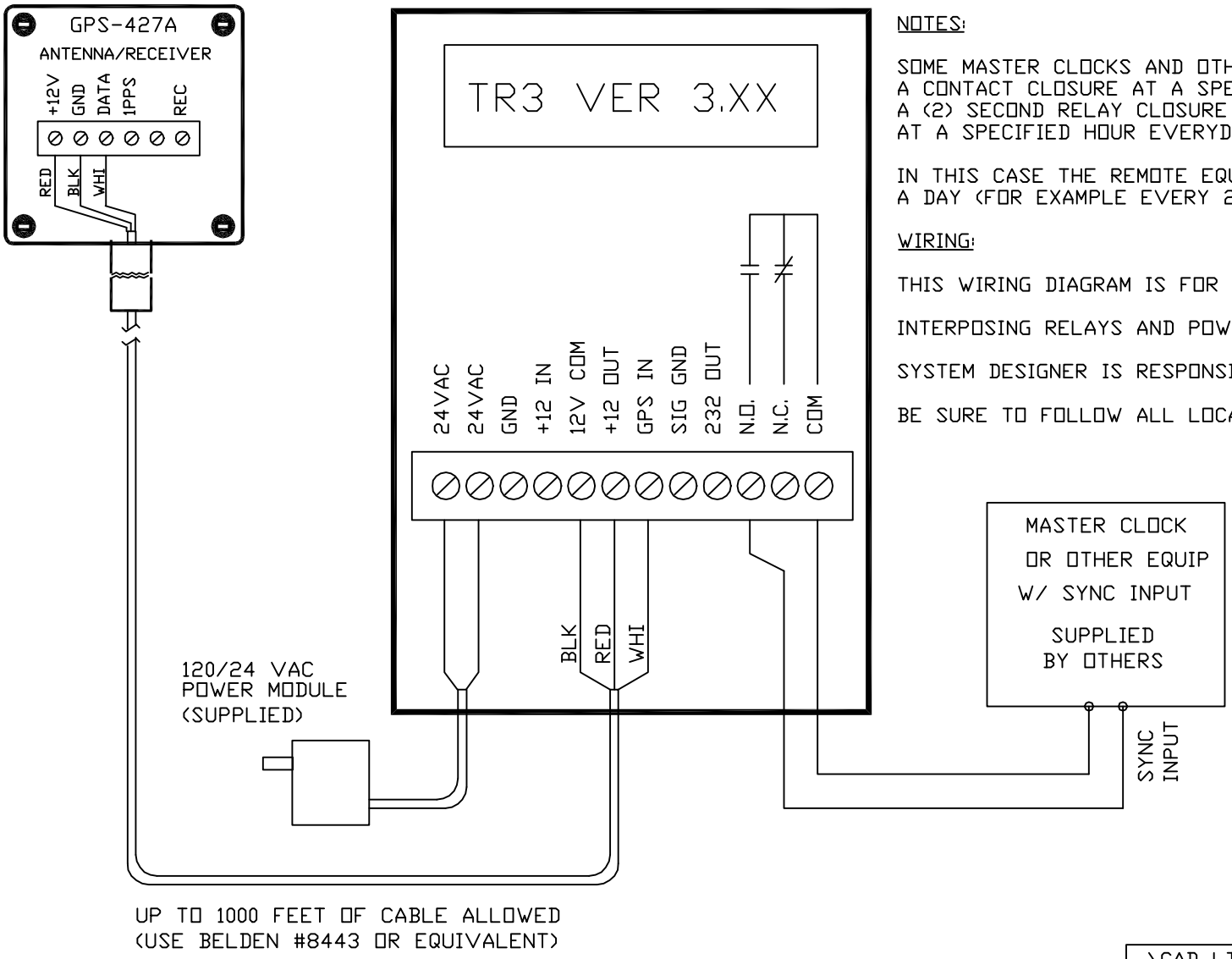

UP TO 1000 FEET OF CABLE ALLOWED
(USE BELDEN #8443 OR EQUIVALENT)

NOTES:

SOME MASTER CLOCKS AND OTHER REMOTE EQUIPMENT REQUIRE A CONTACT CLOSURE AT A SPECIFIED TIME FOR SYNCHRONIZATION. A (2) SECOND RELAY CLOSURE CAN BE PROGRAMMED TO OCCUR AT A SPECIFIED HOUR EVERYDAY, OR ON A SELECTED DAY.

IN THIS CASE THE REMOTE EQUIPMENT IS SYNCHRONIZED ONCE A DAY (FOR EXAMPLE EVERY 24 HOURS).

WIRING:

THIS WIRING DIAGRAM IS FOR REFERENCE ONLY.

INTERPOSING RELAYS AND POWER SUPPLIES MAY BE REQUIRED

SYSTEM DESIGNER IS RESPONSIBLE FOR ALL REQUIRED WIRING.

BE SURE TO FOLLOW ALL LOCAL WIRING CODES

SET-UP:

SET THE HOUR SELECTOR SWITCH TO REQUIRED SYNC TIME.
EXAMPLE SET TO 0 FOR (12:00 AM).
INSTALL THE PM JUMPER IF REQUIRED.
SET THE DAY SELECTOR SWITCH TO POSITION 0 (EDY) FOR EVERYDAY, OR TO OTHER POSITION FOR A SPECIFIC DAY.

REFER TO INSTRUCTION MANUAL FOR MORE DETAILS.

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PROJECT: GPS-TR3 BASED SYSTEM WITH CONTACT CLOSURE SYNCHRONIZATION

DESCRIPTION: WIRING DIAGRAM

SCALE: NONE
JOB #:
SHEET #:
REVISION:
FILENAME: TR3-WD3
DRAWING #:

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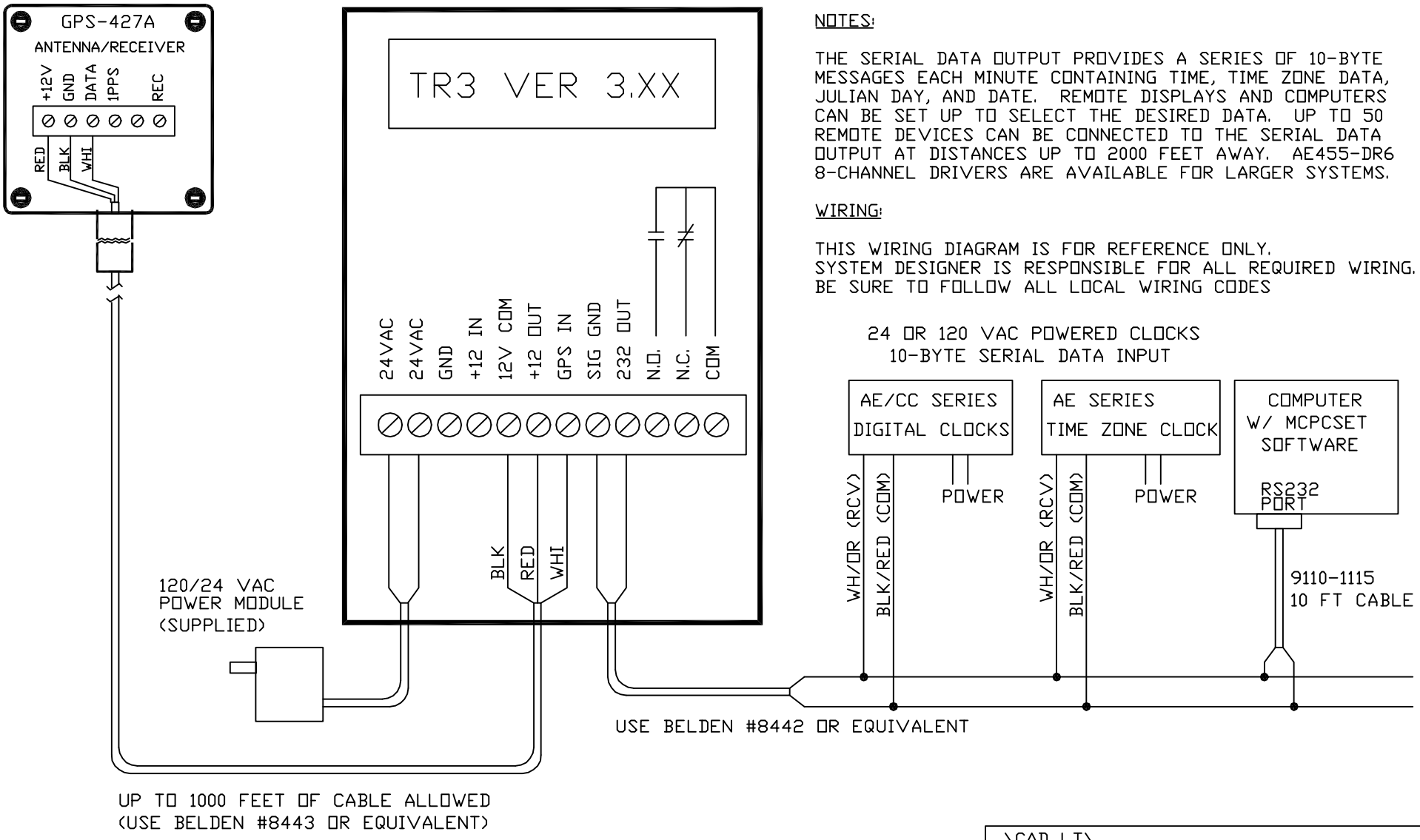

NOTES:

THE SERIAL DATA OUTPUT PROVIDES A SERIES OF 10-BYTE MESSAGES EACH MINUTE CONTAINING TIME, TIME ZONE DATA, JULIAN DAY, AND DATE. REMOTE DISPLAYS AND COMPUTERS CAN BE SET UP TO SELECT THE DESIRED DATA. UP TO 50 REMOTE DEVICES CAN BE CONNECTED TO THE SERIAL DATA OUTPUT AT DISTANCES UP TO 2000 FEET AWAY. AE455-DR6 8-CHANNEL DRIVERS ARE AVAILABLE FOR LARGER SYSTEMS.

WIRING:

THIS WIRING DIAGRAM IS FOR REFERENCE ONLY.
SYSTEM DESIGNER IS RESPONSIBLE FOR ALL REQUIRED WIRING.
BE SURE TO FOLLOW ALL LOCAL WIRING CODES

SET-UP:

NO SET-UP IS REQUIRED FOR THE TR3.
REMOTE DEVICES MAY REQUIRE CHANGES TO ADDRESS SETTINGS.
REFER TO INSTRUCTION MANUAL FOR MORE DETAILS.

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REVISIONS

PROJECT: GPS-TR3 BASED CLOCK SYSTEM WITH SERIAL DATA OUTPUT

SCALE: NONE
JOB #:
SHEET #:
REVISION:
FILENAME: TR3-WD4

DESCRIPTION: WIRING DIAGRAM

DRAWING #:

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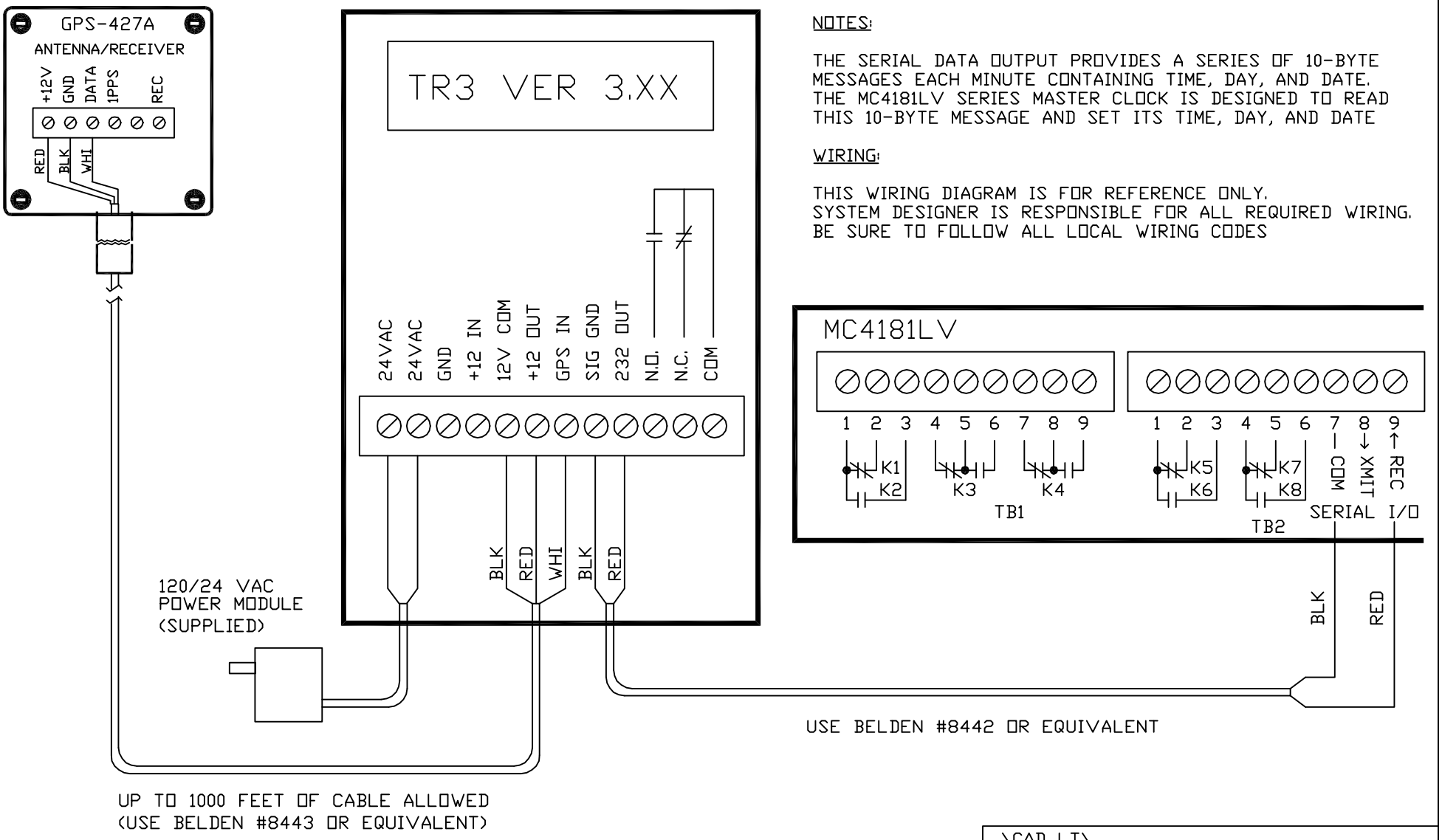

NOTES:

THE SERIAL DATA OUTPUT PROVIDES A SERIES OF 10-BYTE MESSAGES EACH MINUTE CONTAINING TIME, DAY, AND DATE. THE MC4181LV SERIES MASTER CLOCK IS DESIGNED TO READ THIS 10-BYTE MESSAGE AND SET ITS TIME, DAY, AND DATE

WIRING:

THIS WIRING DIAGRAM IS FOR REFERENCE ONLY. SYSTEM DESIGNER IS RESPONSIBLE FOR ALL REQUIRED WIRING. BE SURE TO FOLLOW ALL LOCAL WIRING CODES

SET-UP:

NO SET-UP IS REQUIRED FOR THE TR3.

REFER TO THE MC4181LV SERIES INSTRUCTION MANUAL FOR MORE DETAILS.

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DRAWN BY	JNR 9/29/04
REVISIONS	
PROJECT	GPS-TR3 BASED MASTER CLOCK SYSTEM (MC4181LV SERIES)
DESCRIPTION	WIRING DIAGRAM
SCALE	NONE
JOB #	
SHEET #	
REVISION	
FILENAME	TR3-WD5
DRAWING #	