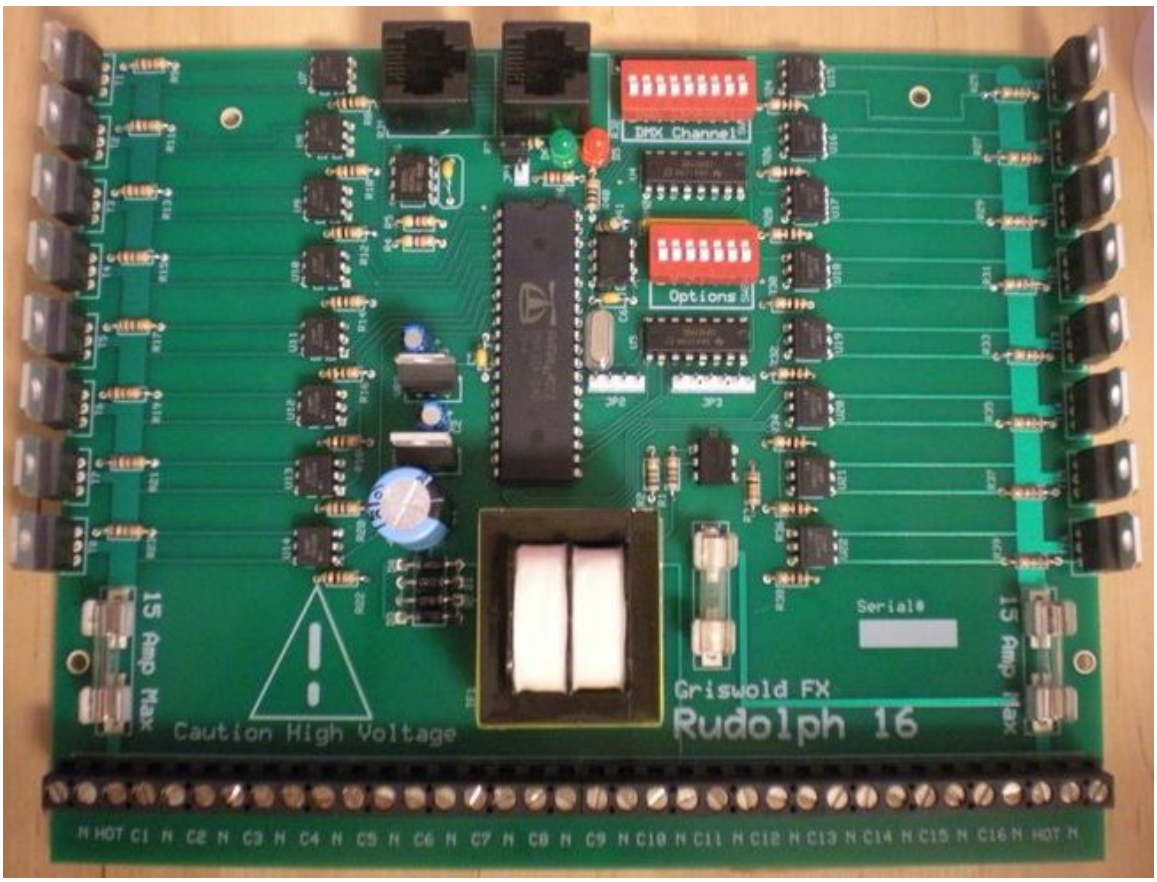
Griswold FX

Rudolph 16

Assembly Manual v1.1



Introduction

The Griswold FX model Rudolph 16 is a 16 channel dimming light controller. It is designed to control 110 and 220 volt holiday lights. The controller receives illumination level information via the DMX512 protocol. It can be controlled by a DMX512 enabled PC or a DMX512 lighting console. Up to 32 Rudolph 16s can be daisy-chained together to form a fully populated DMX512 universe. The Rudolph 16 is considered a "slave" device in a DMX512 network.

DMX512 is the de facto standard for industrial light control.

Getting Started

The first step in assembling your Rudolph 16 should be to inventory the parts. Below is a parts list, with image. Ensure that you have the required quantity of each part.

Mfr. #	Manufacturer	Desc.	Order Qty.	Qty on Hand
CI-192-028-SR	BIVAR	Circuit Board Hardware - PCB Crystal Insultr Tabs 2-Lead Mylar Clear	1	
4308R-101-103LF	Bourns	Resistor Networks & Arrays 10K 8Pin Bussed	1	
BD09	C&K Components	DIP Switches / SIP Switches STD PROFILE 9 POS	1	
BD07	C&K Components	DIP Switches / SIP Switches STD PROFILE 7 POS	1	
770101103P	CTS	Resistor Networks & Arrays 10Kohms 10Pin 2% Bussed	1	
ECS-50-20-4X	ECS	Crystals 5MHz 20pF	1	
C322C104M5U5TA	Kemet	Multilayer Ceramic Capacitors MLCC - Leaded 50volts 0.1uF 20% Z5U	3	
3517	Keystone Electronics	Fuse Clips PC FUSE CLIP 5 MM	6	
REA222M1CBK-1320P	Lelon	Aluminum Electrolytic Capacitors - Leaded 16V 2200uF 20% 12.5x20mm	1	
REA470M1CBK-0511P	Lelon	Aluminum Electrolytic Capacitors - Leaded 16V 47uF 20% 5x11 mm	2	
MOC3023	Lite-On	Triac & SCR Output Optocouplers Optocoupler TRIAC	16	
0217.250HXP	Littelfuse	Cartridge Fuses 250 V 0.25A 5x20mm Fast Acting	1	

0217015.MXP	Littelfuse	Cartridge Fuses 250 V 15A 5x20mm	2	
MAX485EPA+	Maxim Integrated	RS-422/RS-485 Interface IC	1	
1N5817-TP	Micro Commercial	Schottky Diodes 1.0A 20V	4	
24LC256-E/P	Microchip	EEPROM 32kx8 - 2.5V	1	
22-03-2061	Molex	Headers & Wire Housings VERT PCB HDR 6P TIN PLATING	2	
22-03-2041	Molex	Headers & Wire Housings VERT PCB HDR 4P TIN PLATING	1	
22-03-2021	Molex	Headers & Wire Housings VERT PCB HDR 2P TIN PLATING	1	
P8X32A-D40	Parallax	32-bit Microcontrollers - MCU DIP pkg Propeller Chip	1	
BTA08-400BRG	STMicroelectronics	Triacs 8 Amp 400 Volt	16	
LD1117V33	STMicroelectronics	LDO Voltage Regulators 3.3V 0.8A Positive	1	
TS7805CZ	Taiwan Semiconductor	Linear Voltage Regulators 3-Terminal Fixed 5V Vltg Reg 4%	1	
3FS-312	Tamura	Power Transformers 12.6VCT@.2A 6.3V@.4A Single Primary	1	
796949-2	TE Connectivity	Fixed Terminal Blocks 5.08MM VERTICAL 2P wire protector	2	
796949-8	TE Connectivity	Fixed Terminal Blocks 5.08MM VERTICAL 8P wire protector	4	
5556416-1	TE Connectivity	Modular Connectors / Ethernet Connectors 8 PCB TOP ENTRY	2	
CD4014BE	Texas Instruments	Counter Shift Registers 8-Bit Shift	2	
H11AA1	Vishay	Transistor Output Optocouplers Bi-Directional Input	1	
291-10K-RC	Xicon	Carbon Film Resistors - Through Hole 10Kohms 0.05	2	
291-100-RC	Xicon	Carbon Film Resistors - Through Hole 100ohms 0.05	18	
291-180-RC	Xicon	Carbon Film Resistors - Through Hole 180ohms 0.05	16	
291-750-RC	Xicon	Carbon Film Resistors - Through Hole 750ohms 0.05	2	
291-4.7K-RC	Xicon	Carbon Film Resistors - Through Hole 4.7Kohms 0.05	2	
291-120-RC	Xicon	Carbon Film Resistors - Through Hole 120ohms 0.05	1	

Parts Installation

Solder the following parts in the order listed below. Take care to ensure that Integrated Circuits are installed in the proper orientation. Photographs of these parts will help show how they should be properly installed. Circle each part number in this manual as parts are installed. This will help you keep track of what works needs to be complete.

Use small diagonal cutters to trim any excess leads. 

1. Install the following 180 Ohm resistors. (Brown-Grey-Brown-Gold)

   R9 R11 R13 R15 R17 R19 R21 R23 R25 R27 R29,R31 R33 R35 R37 R39

   - TIP: Orient the resistors so that the gold band is on the right (or bottom for vertical installs) side of the board. This makes for easy identification of the part, as all resistors will be oriented the same direction.

2. Install the following 100 Ohm resistors. (Brown-Black-Brown-Gold)

   R7* R8 R10 R12 R14 R16 R18 R20 R22 R24 R26 R28 R30 R32 R34 R36 R38 R40

   *R7 is installed in a vertical position. See Fig 1.

Fig 1

3. Install the following 4.7K Ohm resistors. (Yellow-Violet-Red-Gold)

   R4 R5

4. Install the following 750 Ohm resistors. (Violet-Green-Brown-Gold)

   R1 R2

5. Install the following 10K Ohm resistors. (Brown-Black-Orange-Gold)

   R3 R41*

*R41 will be installed in a vertical position. See Fig1.

6. Install the RN1 10K Ohm 10 pin resistor network. Ensure that the dot on the resistor network package is on the same side as the square pin that indicates pin 1 on the circuit board. See Figure 2.

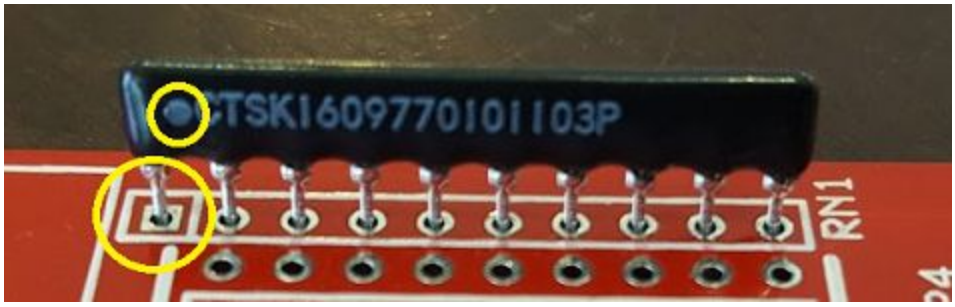


Fig 2

7. Install the RN2 10K Ohm 8 pin resistor network. Ensure that the dot on the resistor network package is on the same side as the square pin that indicates pin 1 on the circuit board. See Figure 2

8. Install the following 1N5817 diodes. Ensure that the diode is oriented so that the white stripe on the diode aligns with the white stripe on the circuit board. See Fig3

   D1 D2 D3 D4

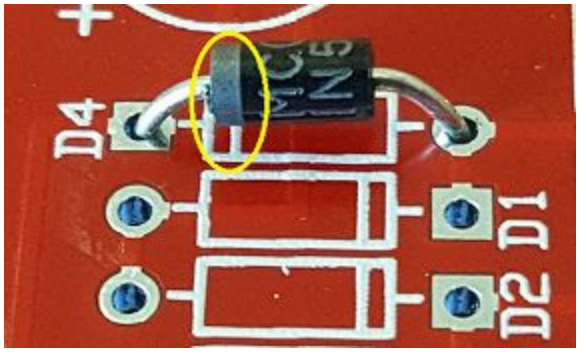


Fig3

9. Install the C1 2200uF capacitor. Ensure that it is oriented so that the negative post is installed on the opposite side of the board from the terminal marked positive. See Fig4.

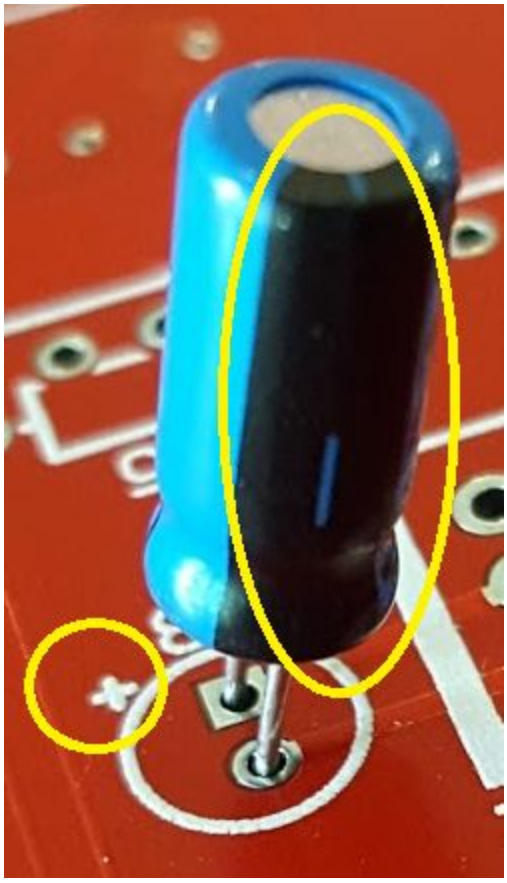


Fig4

10. Install the following 47uF capacitors. Ensure that it is oriented so that the negative post is installed on the opposite side of the board from the terminal marked positive. See Fig4.

    C2 C3

11. Install the following .1uF capacitors. *C4 may need to have it's leads spread apart to install properly.

    C4* C5 C6

12. Install VR1, the 7805 5 volt regulator. Ensure that the back of the device is oriented with white stripe on the circuit board. See Fig5.

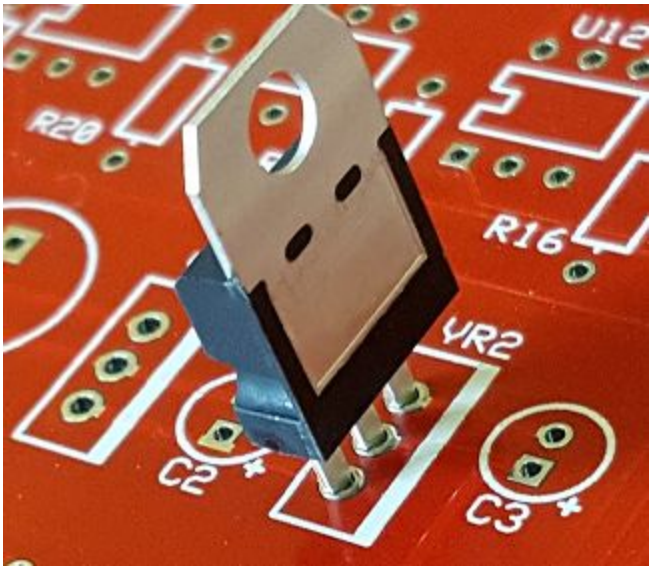


Fig 5

13. Install VR2, the LD1117V33 3.3 volt regulator. Ensure that the back of the device is oriented with white stripe on the circuit board. See Fig5.

14. Install the BTA08 triacs. Ensure that the back of the devices are oriented with white stripe on the circuit board. See Fig5.

    T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16

15. Install the X1 5Mhz crystal. Ensure that you install the mylar insulator between the crystal and the circuit board. See Fig6.

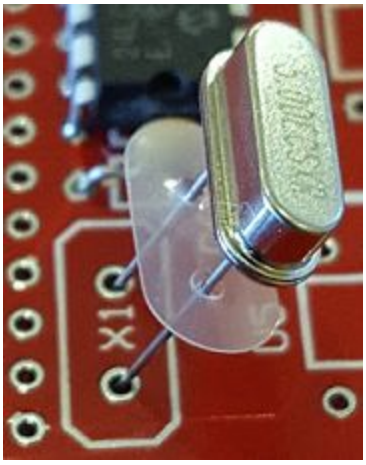


Fig6

16. Install the following LEDs. Ensure that the flat side of the LED is oriented to the flat side indicated on the circuit board. See Fig7.

    D5 - Green D6 - Red

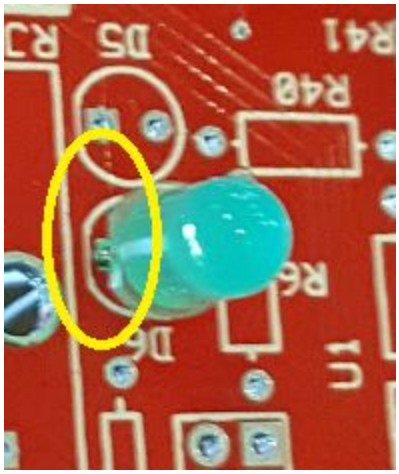


Fig7 (Wrong color pictured for D6)

17. Install the following moc3020 optoisolators. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

    U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19 U20 U21 U22

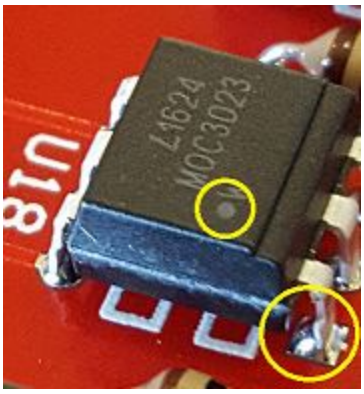


Fig8

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18. Install the U6, ST485BN, RS485 transceiver. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

19. Install the U2, 24LC256 , eeprom. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

20. Install the U1, P8X32A-D40, microcontroller. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

21. Install the following CD4014 shift registers. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

    U4 U5

22. Install the U3, H11AA1, optoisolator. Ensure that the dot on the package orients with the square pin indicating pin 1 on the circuitboard. See Fig8.

23. Install the following fuse holders. Ensure they are properly oriented so that a fuse will fit properly. **Install the fuses in the holders before soldering to ensure a proper fit.** F1 is a .2 amp fuse. F2 and F3 are 15 amp fuses.

    F1 F2 F3

Fig9

24. Install the SW1, DIP switches (9 switches) Ensure that the arrow is pointing in the direction of the top of the board. See Fig10

25. Install the SW2, DIP switches (7 switches) Ensure that the arrow is pointing in the direction of the top of the board. See Fig10

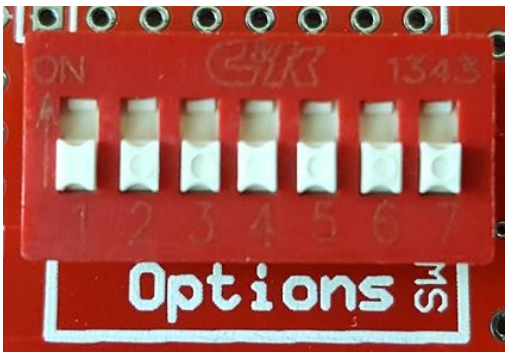

Fig10

26. Install the JP1 2 pin jumper.

27. Install the JP2 4 pin jumper.

28. Install the JP3 6 pin jumper.

29. Install the follow RJ45 connectors. These should snap into place before soldering.

    RJ1 RJ2

30. Assemble the terminal block into a single unit before soldering. The terminal blocks are interlocking pieces. Gaps will occur if you do not assemble the terminal block before soldering. See Fig11. Ensure that the terminal openings are oriented so that they face the edge of the board. See Fig 12

    TB5 TB1 TB2 TB3 TB4 TB6

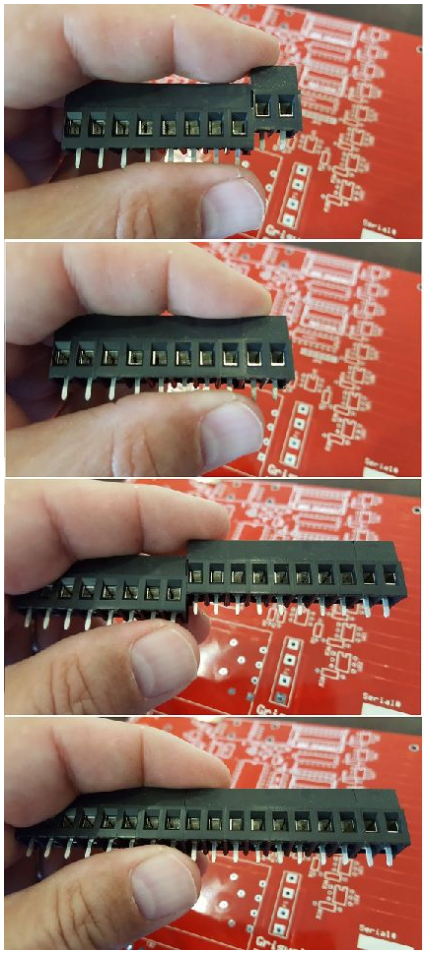

Fig11

Fig 12

31. Install the TF1, power transformer. Ensure that it is oriented so that the #1 pin is aligned with the square #1 pin on the circuit board. See Fig13.

Fig13

Congratulations! You should now have a fully assembled Rudolph 16.