



# Unofficial How-To Guide

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This version April 2023

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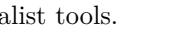
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# Introduction

This ‘Unofficial How-To Guide’ provides step-by-step instructions for a range of tasks, including making cables, unjamming fans, replacing power supplies, and so on. It draws on the personal experience of the authors and the combined skills and knowledge of users of the NABU forum.<sup>1</sup> The tasks described range from simple (  ), requiring few skills or tools, to fiendish (  ), requiring considerable experience or specialist tools.

This guide is ‘unofficial’ because at the time of its creation, the NABU Manufacturing Corp. had been out of business for almost 40 years and so was in no position to sanction its publication. It is also ‘unofficial’ because no one person, or even a group of people, can claim to speak for the NABU community. In many respects, this guide is a joint effort, based on the contributions from numerous people. And while the instructions in this guide are believed to be correct, they are in no way official or even the only way to achieve the stated objectives. Which leads into the final reason for this guide being ‘unofficial’. If through following any of the instructions in this guide you damage your NABU system or anything else, or hurt yourself or others, you will have no one to blame but yourself. Like many things in life, this guide comes with no guarantees, implied or otherwise. That said – and while there are *definitely absolutely no guarantees!* – if you *do* run into problems, you *may* find solace and potentially even solutions in the NABU forum.

Finally, if you would like to provide feedback on this guide, either because you’ve spotted an error of some kind, or because you have one or more suggestions, or for any other reason, please raise a Github ‘issue’ at <<https://github.com/dimitrit/nabu-howto/issues>>.

DT, April 2023

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<sup>1</sup>The NABU forum is hosted by the RetroNet team at <<https://forums.nabu.ca>>.

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# 1 Freeing a stuck fan

In many ‘New Old Stock’ (NOS) NABU Personal Computers the fan either doesn’t spin freely or is completely stuck. Several fixes have been suggested, including bending fan blades or filing down the fan tips. Following is a simpler and less destructive solution. Alternatively, the fan can be replaced following the instructions in Section 5.2, ‘Replacing the NABU fan assembly’ on page 9.

## 1.1 Removing the fan



To prevent electric shock, you **must** disconnect your NABU Personal Computer from mains power before removing the system cover!

1. Remove the outer computer cover by undoing the screws on either side of your NABU system. This will expose the main system board (right) and power supply bay (left).
2. Remove the cover over the power supply by undoing the two screws on the right-hand side and lifting the cover upwards.
3. Undo the 3 bolts that hold the fan assembly in place and free the fan such that the 3 adjustment screws (a) are accessible (see Figure 1.1).

## 1.2 Adjusting the fan assembly

1. Loosen the screws and gently adjust the blade assembly until the fan blades spin freely, then re-tighten the screws. Since the tolerance can be very tight, the process may need to be repeated as necessary.

## 1.3 Re-installing the fan

1. Place the fan back into the system such that the adjustment screws are facing outwards. Then fix in place using the 3 nuts and bolts from step 1.1.3.
2. Check that there are no loose parts left in the computer case, then replace the NABU PSU cover and fix in place with its 2 screws.
3. Replace the NABU system cover, securing it with 4 screws.



Figure 1.1: Adjust the blade assembly screws.

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## 2 Making a Keyboard Adaptor cable



Some ‘New Old Stock’ (NOS) NABU Personal Computers are being sold without keyboards. Keyboards for other NABU PCs have over the years been misplaced or have developed faults. To address these issues, the NABU Preservation Project has released a Keyboard Emulator<sup>1</sup>. The Keyboard Emulator software, in combination with a USB to RS-422 interface and a keyboard adaptor cable, allows NABU systems without keyboards to be controlled from a Windows PC. This section describes how to create the required DB-9 to DIN-6 keyboard adaptor cable.

### 2.1 Keyboard Adaptor cable wiring

The KEYBOARD port on the back of the NABU Personal Computer implements a half-duplex RS-422 interface, which requires 2 wires for communication between devices. The cable must be connected as specified in Table 2.1. For best performance, the adaptor cable should be kept as short as possible — preferably less than 6 inches. Twisted-pair cable is highly recommended. To avoid a ground loop, only connect ground to either the DB-9 or DIN-6 connector, *never both*.

|        | NABU (DIN6) | RS-422 (DB9) <sup>2</sup> |        |
|--------|-------------|---------------------------|--------|
| Signal | Pin         | Pin                       | Signal |
| T/R+   | 4           | ↔ 1                       | T/R+   |
| T/R-   | 5           | ↔ 2                       | T/R-   |

Table 2.1: Adaptor cable wiring.

### 2.2 DIN-6 end of the cable

1. Solder the pins of a male DIN-6 connector as shown in Figure 2.2. Note that the pin numbers shown in the diagram are for the solder side of the connector.

### 2.3 DB-9 end of the cable

1. Solder the pins on the female DB-9 connector as shown in Figure 2.3. Note that the pin numbers shown in the diagram are for the solder side of the connector. Alternatively, use a DB-9 adaptor with screw terminals, as shown in Figure 2.4.

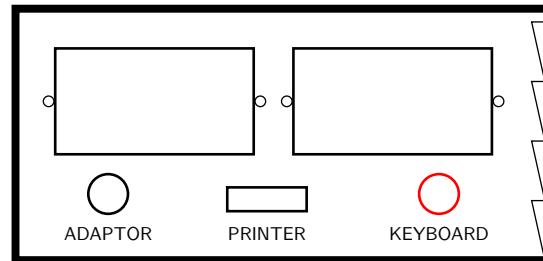


Figure 2.1: NABU Personal Computer KEYBOARD port.

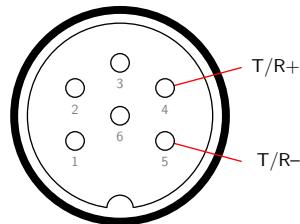


Figure 2.2: DIN-6 male connector (solder side).

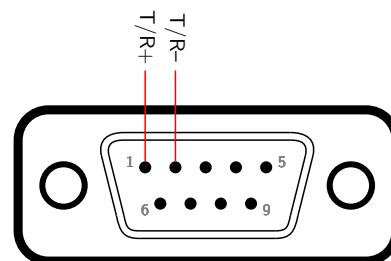


Figure 2.3: DB-9 female connector (solder side).<sup>2</sup>

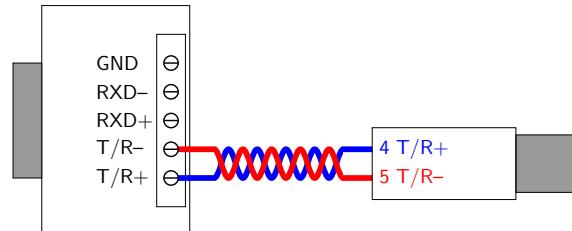


Figure 2.4: DB-9 adaptor to DIN-6 wiring.<sup>2</sup>

<sup>1</sup>See the NABU RetroNet website <<https://nabu.ca>> for details.

<sup>2</sup>Pin numbers shown are for the DTECH DT-5019 USB TO RS485/422 adaptor cable. Refer to the relevant manufacturer’s documentation for other RS-422 interfaces.

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### 3 Making a Printer cable



The NABU Personal Computer PRINTER port allows printers with Centronics (parallel) interfaces to be connected. Since the NABU port features a non-standard parallel port connector, either a custom cable or adaptor is required. This section describes both how to wire a cable with a DB-15 connector to a 36-way Centronics printer connector and how to make an adaptor, which allows ‘standard’ printer cables to be used with the NABU.

#### 3.1 NABU Printer cable wiring

The PRINTER port on the back of the NABU Personal Computer implements a parallel interface. To make a printer cable use the wiring as specified in Table 3.1. For best performance, the cable should be shielded.

| NABU (DB-15) |     | Printer (Centronics) |                  |
|--------------|-----|----------------------|------------------|
| Signal       | Pin | Pin                  | Signal           |
| Strobe       | 1   | ↔                    | 1 Strobe         |
| Data 0       | 2   | ↔                    | 2 Data 0         |
| Data 1       | 3   | ↔                    | 3 Data 1         |
| Data 2       | 4   | ↔                    | 4 Data 2         |
| Data 3       | 5   | ↔                    | 5 Data 3         |
| Data 4       | 6   | ↔                    | 6 Data 4         |
| Data 5       | 7   | ↔                    | 7 Data 5         |
| Data 6       | 8   | ↔                    | 8 Data 6         |
| Data 7       | 9   | ↔                    | 9 Data 7         |
| Busy         | 11  | ↔                    | 11 Busy          |
| Ground       | 15  | ↔                    | 16, 19–30 Ground |

Table 3.1: Printer cable wiring.

#### 3.2 NABU (DB-15) end of the cable

1. Solder the pins of the male double-row DB-15 connector as shown in Figure 3.1. Note that the pin numbers shown in the diagram are for the solder side of the connector.

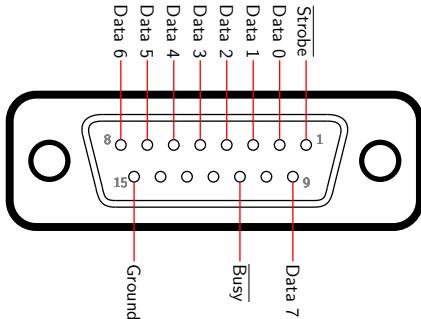


Figure 3.1: DB-15 male connector (solder side).

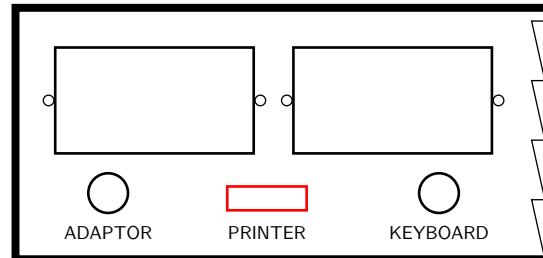


Figure 3.2: NABU Personal Computer PRINTER port.

#### 3.3 Printer (Centronics) end of the cable

1. Solder the pins of the male Centronics connector as shown in Figure 3.3. Note that the pin numbers shown in the diagram are for the solder side of the connector.

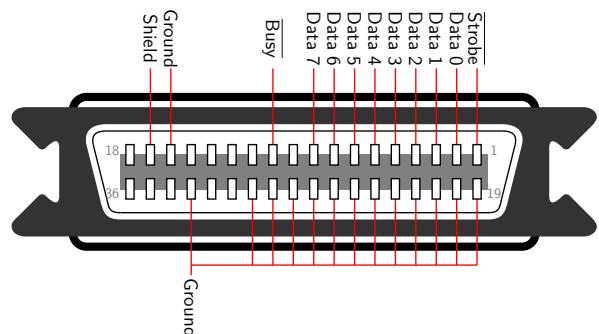


Figure 3.3: Centronics male connector (solder side).

### 3.4 NABU Printer Adaptor wiring

To make an adaptor cable that allows the use of standard parallel printer cables use the wiring as specified in Table 3.2. The DB-15 connector (at the NABU end) should be wired as described in section 3.5.

| NABU (DB-15) | Adaptor (DB25) |     |              |
|--------------|----------------|-----|--------------|
| Signal       | Pin            | Pin | Signal       |
| Strobe       | 1              | ↔   | 1 Strobe     |
| Data 0       | 2              | ↔   | 2 Data 0     |
| Data 1       | 3              | ↔   | 3 Data 1     |
| Data 2       | 4              | ↔   | 4 Data 2     |
| Data 3       | 5              | ↔   | 5 Data 3     |
| Data 4       | 6              | ↔   | 6 Data 4     |
| Data 5       | 7              | ↔   | 7 Data 5     |
| Data 6       | 8              | ↔   | 8 Data 6     |
| Data 7       | 9              | ↔   | 9 Data 7     |
| Busy         | 11             | ↔   | 11 Busy      |
| Ground       | 15             | ↔   | 18–35 Ground |

Table 3.2: Printer adaptor wiring.

### 3.5 Adaptor (DB-25) end of the cable

1. Solder the pins of a female DB-25 connector as shown in Figure 3.4. Note that the pin numbers shown in the diagram are for the solder side of the connector.

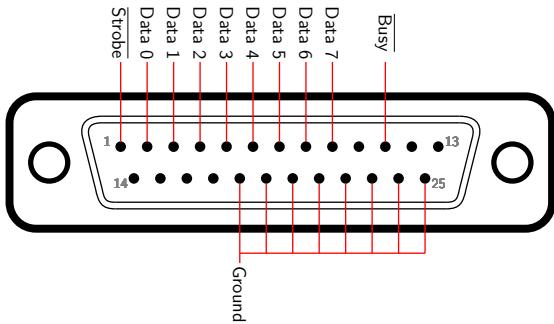


Figure 3.4: DB-25 female connector (solder side).

# 4 Making a Network Adaptor cable



The NABU Network Adaptor is the interface between the NABU Personal Computer and the cable television network that enables software applications and other digital data to be downloaded from NABU's back-end systems. The NABU Preservation Project has released an Internet Adaptor<sup>1</sup>, which emulates the NABU Network Adaptor, allowing a NABU PC to download applications and data via the Internet. This section describes how to create a DB-9 to DIN-5 adaptor cable that allows a NABU PC to be connected via RS-422 to a system running the Internet Adaptor software. If required, a RS-422 interface can easily be added to the system hosting the Internet Adapter by means of a USB to RS-422 adaptor.

## 4.1 Network Adaptor cable wiring

The ADAPTOR port on the back of the NABU Personal Computer implements a full-duplex RS-422 interface, which requires 4 wires for communication between devices. Because of the high transmission (baud) rates involved, a twisted-pair shielded cable is highly recommended for the DB-9 to DIN-5 adaptor (as per the RS-422 standard). Category 5 cable (as used in Ethernet cabling) is available both as shielded twisted pair and as unshielded twisted pair and generally exceeds the recommendations for RS-422, making it an excellent choice — if no twisted pair cable is available, the length of the adaptor cable *must* be kept as short as possible, and should not exceed 6-8 inches. When using shielded cable, the shielding must only be connected to one of the connectors to avoid a ground loop.

The cable must be wired as specified in Table 4.1. If at all possible, use twisted-pair cable and group the pairs as shown.

| NABU (DIN5) |      | RS-422 (DB9) <sup>2</sup> |        |        |
|-------------|------|---------------------------|--------|--------|
| Signal      | Pin  | Pin                       | Signal |        |
| Pair 1      | RXD+ | 1                         | ↔      | 1 T/R+ |
|             | RXD- | 4                         | ↔      | 2 T/R- |
| Pair 2      | T/R+ | 5                         | ↔      | 3 RXD+ |
|             | T/R- | 3                         | ↔      | 4 RXD- |

Table 4.1: Adaptor cable wiring.

## 4.2 DIN-5 end of the cable



To avoid a ground loop, the cable shield should only ever be connected to ground at one end of the cable; *never* at both ends. Thus, if the cable shield is connected to ground at the RS-422 adaptor end, do *not* also connect the shield to the outer rim of the DIN connector, or vice versa.

1. To minimise the number of connections that need to be soldered, a MIDI cable may be used. Alternatively,

<sup>1</sup>See the NABU RetroNet website <<https://nabu.ca>> for details.

<sup>2</sup>Pin numbers shown are for the DTECH DT-5019 USB TO RS485/422 adaptor cable. Refer to the relevant manufacturer's documentation for other RS-422 interfaces.

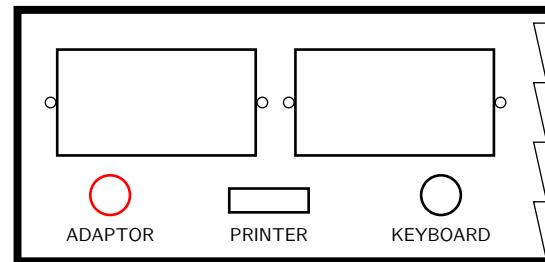


Figure 4.1: NABU Personal Computer ADAPTOR port.

solder the pins of a male DIN-5 connector as shown in Figure 4.2. Note that the pin numbers shown in the diagram are for the solder side of the connector. Also note that the DIN-5 connector pins are not numbered sequentially.

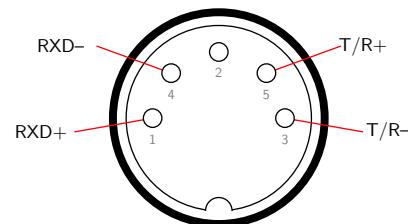


Figure 4.2: DIN-5 male connector (solder side).

## 4.3 DB-9 end of the cable

1. Solder the pins on the female DB-9 connector as shown in Figure 4.3. Note that the pin numbers shown in the diagram are for the solder side of the connector.

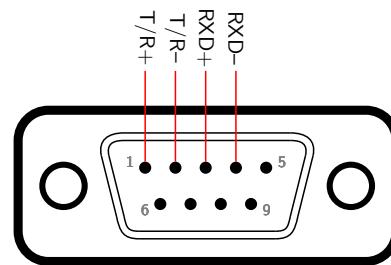


Figure 4.3: DB-9 female connector (solder side).<sup>2</sup>

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# 5 Replacing the NABU Power Supply



The NABU Personal Computer was developed for the North-American market, and as such, was fitted with a 110-120V power supply unit (PSU). The following section explains how to replace the NABU power supply with a modern, universal power supply. Note that the replacement PSU referred to in this guide is the Mean Well RT-65B. Refer to the relevant manufacturer's documentation for connection details when using other makes or models.

## 5.1 Removing the NABU PSU



To prevent electric shock, you **must** disconnect your NABU Personal Computer from mains power before removing the system cover!

1. Remove the outer computer cover by undoing the screws on either side of your NABU system. This will expose the main system board (right) and power supply bay (left).
2. Remove the cover over the power supply by undoing the two screws on the right-hand side and lifting the cover upwards.
3. Disconnect the motherboard (a), mains (b), and ground (c) connectors, as shown in Figure 5.1 below.
4. Undo the 4 screws holding the PSU in place, and remove the PSU.
5. Cut off both the motherboard (a) and mains (b) connectors as close as possible to each connector and strip a

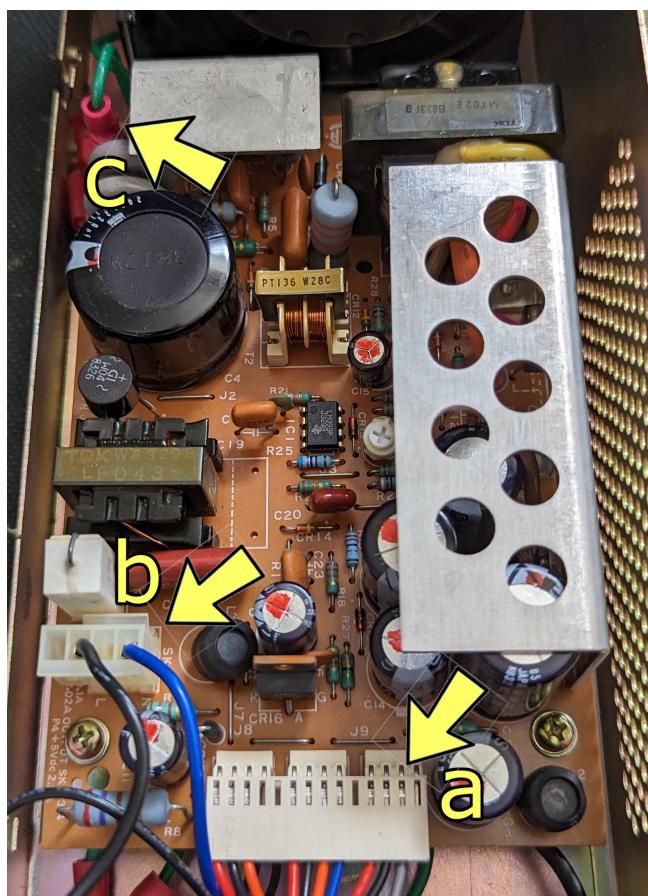


Figure 5.1: PSU connector positions.

$\frac{1}{4}$ inch of insulation of the ends of all wires. Cut off the spade connector (c) and halve the length of the ground wire.

## 5.2 Replacing the NABU fan assembly

As the fan fitted in the NABU power supply bay runs off 110-120V, it is no longer useful and should be removed. A suitable 80x80mm 12V or 5V fan may be fitted in its place.

1. To remove the fan, prise apart the crimp connector and cut the other lead near power button.
2. Undo the 3 bolts which hold the assembly in place and remove the fan.
3. Remove the remaining part of the fan power lead attached to the power button by gently removing the old heat shrink tubing and cutting the lead as close as possible to the terminal (see Figure 5.2a). Then re-cover the terminal and remaining lead with a suitable length of new heat shrink tubing (as shown in Figure 5.2b).
4. Remove the fan ground lead from the 'ground post' by undoing the nut and lifting off the ring connector.
5. Install the replacement fan using the bolts removed in the previous step, ensuring it is oriented such that air is sucked out of the NABU system. Guide the new fan leads towards the front of the system.

## 5.3 Replacing the mains cable

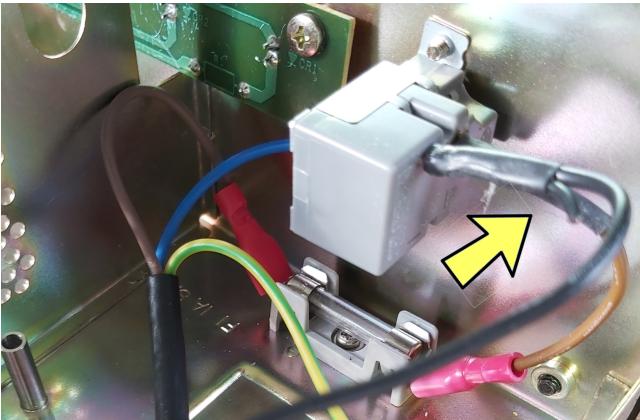
The mains cable fitted to the NABU may be left in place and the Canada/US power plug replaced with a 3-pin domestic plug as appropriate. If the NABU cable is left in place, make note of the following colours and wire your domestic plug as shown in Table 5.1.

| NABU lead | Function |
|-----------|----------|
| Green     | Earth    |
| White     | Neutral  |
| Black     | Live     |

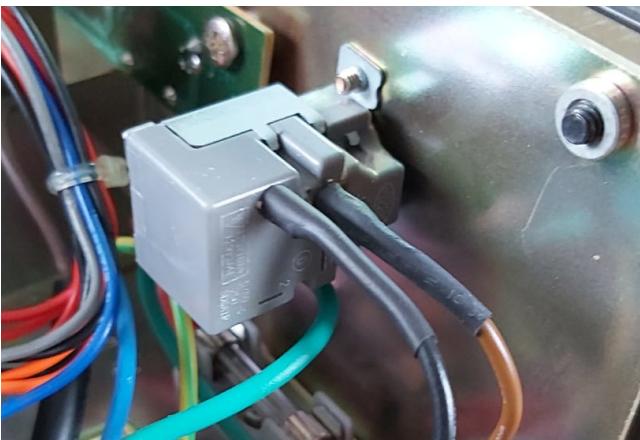
Table 5.1: NABU mains lead details.

Alternatively, the NABU mains cable can be replaced as following:

1. Cut the NABU mains lead on the **inside** of the NABU system as close as possible to the strain relief bush grommet. Then pull the lead from the outside to free it from the grommet — this may require some force and wriggling.



(a) Remove the remaining length of the fan power lead.



(b) Cover the power terminal with new heat shrink tubing.

Figure 5.2: Removing fan power lead.

2. Pass the new cable through the hole in the back of the case and secure it in place with the strain relief grommet recovered from the previous step. Allow enough length for the wires to comfortably reach the front of the NABU.
3. Use a crimp tool to attach a ring connector to the mains Ground lead (green). Then attach a female spade connector to the Live lead (brown). Ensure that each connectors is securely attached to its lead to prevent poor contact.
4. Firmly push the spade connector onto the fuse holder terminal. Loop the ring connector over the vertical ‘ground’ post and secure it in place with a nut (as shown in Figure 5.3). Note that the fuse itself does *not* need to be replaced.

## 5.4 Installing the Mean Well PSU

The NABU requires multiple voltage levels, as detailed in the following table. The first two columns show the Mean Well RT-65B PSU terminals and their corresponding levels. The remaining columns show the colour and number of NABU wires that must be connected to each terminal. For example, both the single grey wire and two orange wires need to be connected to the terminal labelled  $[+V2]$  on the PSU.

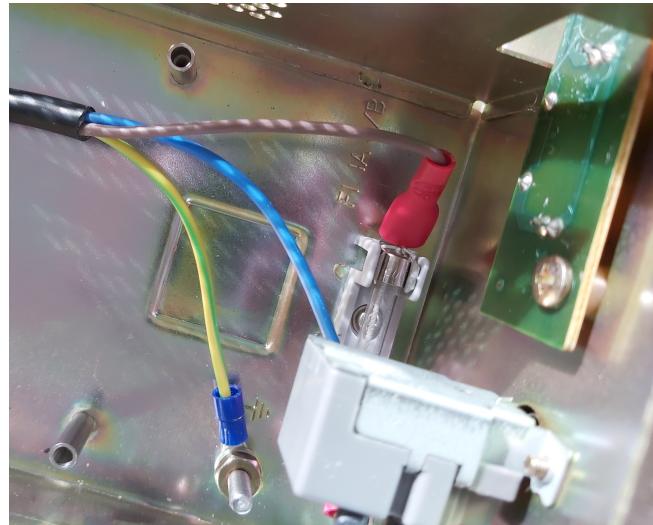


Figure 5.3: Connect the Ground (green) and Live (brown) wires.

| RT-65B  | Level  | Colour | Wires |
|---------|--------|--------|-------|
| $[V3]$  | -12V   | Blue   | 1     |
| $[+V2]$ | +12V   | Grey   | 1     |
|         |        | Orange | 2     |
| $[COM]$ | Ground | Black  | 3     |
| $[+5V]$ | +5V    | Red    | 3     |

Table 5.2: Motherboard wiring details.

To install the replacement PSU:

1. If the mains cable was replaced, reattach the short ground lead (green) to the ground post and fix it in place with a nut.
2. Place the Mean Well PSU such that the mounting hole near the  $[+5V\ Adj]$  trimmer on the PSU is lined up with the front right-hand post in the NABU bay and fix it in place with a screw. Note that the other posts do not line up with the remaining PSU mounting holes, meaning the PSU is kept in place with only a single screw.
3. Attach the mains wires as shown. Be careful not to mix up the mains wires with the wires connected to the NABU motherboard.

| RT-65B                      | Level   | Colour |
|-----------------------------|---------|--------|
| $L$                         | Live    | Black  |
| $N$                         | Neutral | Blue   |
| $\underline{\underline{L}}$ | Ground  | Green  |

Table 5.3: Mains wiring details.

4. Connect the wires leading from the NABU motherboard, as shown in Table 5.2 (above) and Figure 5.4.
5. Connect the new fan leads to the PSU  $[COM]$  and either  $[+5V]$  or  $[+V2]$  terminals as appropriate.



Figure 5.4: Connect all wires to the relevant PSU terminals.

6. Check there are no loose parts or unconnected wires — any wires that remain unconnected **and are no longer required** must be trimmed and made safe, e.g. by covering them with electrical insulation tape or heat shrink tubing. Once you are satisfied that all wires are correctly and securely connected, replace the NABU PSU cover and fix in place with its 2 screws.
7. Replace the NABU system cover, securing it with 4 screws.

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