

AA1 AUTOANSWER/AUTODIAL BOARD

FOR

Minor Miracles

MODEM WS2000

Instruction Manual

Issue 1a (Preliminary)

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## AUTODIAL/ANSWER BOARD AAI FITTING & USE INSTRUCTIONS for use with MODEM WS2000

### FITTING THE AAI AUTODIAL/ANSWER BOARD TO THE WS2000 MODEM

The AAI board fits inside the WS2000 modem, on a plug already provided. To gain access to the plug, first disconnect the modem from the mains and from the telephone line and the computer.

Remove the two screws holding the case together, and carefully remove the top half of the case.

You will see in the middle of the main printed circuit board an area marked "AA board location". At the top of this area is a 10-way board plug, with right-angled pins.

On this board plug will be a four-way link, which you must now remove. Keep this link, as it can be used to short the Data Carrier Detect assert pins on the AAI if required.

Carefully fit the AAI board socket to the board plug, taking care not to trap or pull any wires---particularly the four phone line wires.

Now peel back part of the tape covering the holes marked "AUTO" in the modem back panel, and fit the AAI switch to the upper hole. This switch must be fitted the correct way up, and this is dictated by the colour of the wires fitted. You may have one of two colour sets on your switch, so fit the switch so that either the RED AND BLACK or the PURPLE AND GREEN wires are upward, depending upon which colours are actually fitted on your AAI.

Stick the label provided on the rear panel. Switch positions are: Up off, Centre Answer, Down Dial. The off position returns the modem to normal manual use.

### SETTING MODEM LINKS

Set the internal links on WS2000 with DTR external, DCD external if you want to use Data Carrier Detection, otherwise set CTS external, DCD internal, and RTS internal. If your WS2000 has the link switch system (SWS) fitted, then A is CTS, B is DCD, C is RTS and D is DTR. When these links are made the handshake is external, unmade is internal. If you have the discrete links fitted, then these are clearly marked with their function.

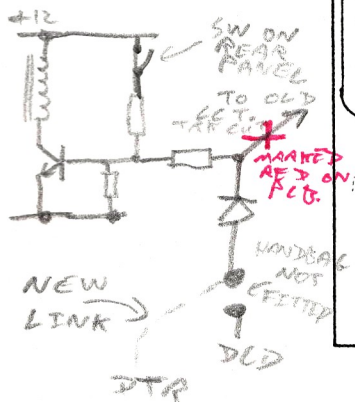
### MODEM TO COMPUTER CONNECTING LEAD

If using a BBC computer, you will have to connect the RTS handshake wire (white wire on the centre pin of the modem end 6-way plug) to the DTR handshake line pin (pin 3, immediately below the centre pin). Disconnect and leave disconnected the green wire originally on pin 3. This is the only way a BBC can control a device like the AA board, since it lacks a DTR handshake line; we have to use the RTS line to simulate DTR. Other computers able to use DTR will be connected normally, unless DTR is impossible to easily take high and low, in which case the RTS line can be used instead as described for the BBC.

MODS 8/1/85

TRK CUT NEAR SKT MARKED ON BOARD  
TO DISABLE LINE SHORT.

LINK ADDED  
TO DISABLE  
LINE OPEN  
RLA



Adjust line seize  
time here, using  
small screwdriver

AAI Board component locations

So we suggest that you do not use this method of line disconnection alone, but arrange your software to look constantly for valid incoming data at the computer's input buffer. Carriage returns are the most reliable thing to look for. Then you should put a notice on the answer terminal introduction as seen on screen by the calling party, to say that if there is no data received in a given period--say 1 minute--the line will be disconnected. Then allow your software to take DTR low to drop the line if no data is received in a 1-minute period.

The suggested programme 'TERMINAL' does this. It is written for the BBC computer. After DTR has been taken low to drop the line, it should be held low for greater than the period of the line voice relay timer before being taken high again to wait for the next incoming call.

This answer board will give the correct answer tones as required by CCITT and BELL standards. These may include a period of silence before any carrier is heard, and may include carriers of two tones.

The complete setup for, say, a private Bulletin Board would be: WS2000 set to CCITT 300 BAUD Answer, with AA1 board fitted and with its switch in the centre, Answer, position, modem turned On Line, Bulletin Board software loaded and running.

This setup would be able to answer the line, give an introductory header, run into software for information exchange, look for a lack of carrier or data activity, and on lack of activity disconnect the line and return to the wait point for the next call.

### IMPORTANT NOTES - READ CAREFULLY

The operation of the AA1 Answer/Dial board is entirely dependant upon correct operation of your computer software. Each AA1 board is tested before leaving our factory, so that it functions within specification. If you have difficulties setting up the operations you require, then it is 99 per cent certain that the problems can be resolved by, and indeed lie within, the software you are running.

Please don't telephone us for advice on setting up answer or dial systems, as our telephone operatives will not be able to answer your questions. If you are really stuck, then please write to us, clearly and concisely stating the problem, and enclosing a Stamped Self-addressed Envelope for our reply.

The difficulty most often encountered is getting reliable dial-out. The problem always lies in the exact timings used, and the best suggestion here is to listen carefully to the dial-out rate of a standard telephone, then try to copy that in your software loops. Try different digit dial rates, and different inter-digit pauses.

PLEASE NOTE THAT THIS DEVICE, AUTO ANSWER/DIAL BOARD AA1, IS BELL AND CANNOT BE, LEGALLY APPROVED FOR USE ON THE BRITISH PUBLIC SWITCHED TELEPHONE NETWORK, DUE TO ITS SOFTWARE CONTROLLED DESIGN. MIRACLE TECHNOLOGY (UK) LIMITED THEREFORE ACCEPTS NO LIABILITY FOR ANY CONSEQUENCES OF THE USE OF THIS DEVICE.

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Now replace the top of the modem, and screw it together---take care that the lid is the right way round, with ridges and channels aligned on the sides.

### INITIAL TESTING

To check for correct operation in the Answer mode, set the switch to the centre position, set the modem On Line and connect it to a phone line. Do not connect the computer at present. Now either get somebody to phone you, or use a callback code, such as 174 (dial 174, when you hear a tone, replace the handset and the phone will ring). The modem should answer the call immediately, and go on line. After 40 seconds or so, it should drop the line and wait for the next call. If the computer is now connected, and DTR asserted, this will hold the modem on line after the timer has timed out, and until DTR is dropped. When DTR is dropped the modem should go off line.

### Autodialler testing.

If running a BBC computer, load the programme provided here, and this will allow you to dial out. On other computers, you will have to create your own software using the parameters set out below.

### AUTO DIAL PROTOCOL

This autodialler is entirely dependant upon the host computer to drive it. It has no intelligence, no numbers storage, and no internal timing. All these must be catered for by your host computer's software and RS232/423 port.

However, do not be daunted!! It is quite simple to provide these drives, and we chose to make the autodialler in this way so that you could in fact end up with a most sophisticated system.

The autodialler is switched on by setting the rear panel switch in its bottom position.

To drive this autodialler, you will need to be able to control the handshake line Data Terminal Ready between the computer and the modem. A number of computers do not support DTR, and in these cases the Request To Send (RTS) line can be used. If you don't have an RTS line, then you will need to find another control line that you can switch up and down under software control.

The dialler uses three relays. One seizes the line when dialling is completed, one places a low resistance across the line during dialout of each digit, and the third opens the line current loop to dial a digit.



The line seize and line short relays are not under your direct control. The line seize relay is switched by a timer, nominally set at 40 seconds, but adjustable by potentiometer RV1. This time period is started when the first dial pulse is output on the TD line.

The line short relay is needed since it is a requirement of telephone companies that the line is effectively shorted between the dialling of each digit. In this autodialler, this is achieved by a timer, set to nominally 1 second, and not adjustable, but retriggeable. It is triggered, and the line shorted, each time DTR goes from High to Low, and then releases 1 second later, unless reset by another DTR High-Low transition.

The dial relay is connected in series with the line, and when it is opened it interrupts the current flowing in the line, thus causing the exchange equipment to register the dialling of a single pulse. To dial a 5, therefore, five pulses are needed: to dial a 9, nine pulses, and for a 0, ten pulses. This dial relay is opened to dial a pulse by taking the Transmitted Data line from Low to High. Each Low-High transition opens the relay once, causing a single pulse to be dialled.

Thus, the dialling of a 7 would be achieved by taking the DTR line from high to low initially, to cause the line to be shorted, then taking the TD line high, then DTR high and back low immediately to retrigger the short line timer, then taking TD high again to dial a pulse, and so on seven times. If this digit is the last of a phone number, DTR is finally taken High when the Terminal Programme software is entered.

So, the Protocol for dialling a phone number is this:

```
INITIALISE (DTR High to Low to short the line)
PAUSE for 0.25 seconds to allow line current to steady
DIAL PULSE by taking TD high, then returning it low
PAUSE to allow short line timer to release short (0.2 seconds approx)
RETRIGGER short line relay by taking DTR low, then high
DIAL PULSE as before
PAUSE as before
RETRIGGER as before
DIAL PULSE as before
PAUSE as before
RETRIGGER as before
(this would have dialled a 3)
WAIT between digits for, say 0.25 seconds
THEN
  repeat
  for
  other digits
  PAUSE to wait for number to connect
  RUN terminal programme to receive data
```

## AUTO ANSWER

The auto answer mode is entered by setting the AA switch to its centre position.

In this position power is disconnected from the dial circuitry, leaving only the answer circuitry in action.

Now, if the modem is switched on and connected to a phone line, and the front panel switch is in the ON LINE position, any call to the modem's phone line will cause it to seize the line.

It detects the ring on the line, and sets a timer to seize and hold the line for a period, nominally set for 40 seconds. This time period can be adjusted by RV1—clockwise for shorter time, anti-clockwise for longer time.

In a normal set-up, the computer will have been left with a terminal programme running, and the modem connected and in answer mode, with the line switch On Line. The computer will be holding DTR High. When the modem answers the line, it not only sets the timer for 40 seconds, but it latches the DTR line to hold the seize line relay ON even after the timer times out.

The result of this is that when the timer times out, the line will still be held if DTR is High. If DTR is not high, then when the timer times out, the line will be dropped. And if DTR is taken from High to Low at any time after the timer has timed out, then the line will be dropped at that moment.

After the line has been dropped, then DTR may be raised again to leave the terminal ready to receive the next call.

It is also possible to use Data Carrier Detect to sense whether there is a carrier on the line, after a ring has been answered. If there is no carrier, then the line may be dropped by the modem. To allow use from the DCD line, a link is provided on the AA board, next to the 10-way socket. The link has two vertical pins, and if these are connected together—use the link plug you removed when you fitted the AA board—then the DCD line will also latch the seize line relay on. BUT, the DCD line is in fact not a particularly reliable measure of whether there is anyone on the line, as it can be held high not only by a carrier, but also by noise and other signals on the phone line.