



HY02 DIGITAL AUTOMATIC TELEPHONE BALANCE UNIT USER HANDBOOK

DHY 02EC Single automatic TBU, eurocard version.

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Connection of Apparatus to BT Lines

Equipment Type : Sonifex HY02 *Digital* Eurocard Telephone Balance Unit
BABT Approval Number : S/3619/23/L/501793

This apparatus is suitable for connection directly to the network by means of the cable mounted plug provided. If you require an appropriate BT socket, or sockets, installed in order to use this equipment then this form should be sent to your local telephone area office.

Name
Company
Address
.....
.....
.....

Equipment Type : Sonifex HY02 *Digital* Eurocard Telephone Balance Unit
BABT Approval Number : S/3619/23/L/501793

To British Telecom Area Office :

Please supply a BT line socket for connection of the above apparatus to :

A new line An existing line

at the above address. The appropriate equipment details are as above.

Signed Date

Warranty And Safety Information

Warranty Registration HY02 *Digital* Eurocard TBU

Warranty Details

The HY02 *Digital* audio product is guaranteed for 12 months from the date of purchase.

The components and materials used are guaranteed against defects and faulty workmanship. Sonifex undertake to replace or repair faulty items at its discretion, within the warranty period, on a return to factory basis.

In addition, the HY02 *Digital* product is a complex microprocessor controlled machine. In order to register the date of purchase it is important to complete the WARRANTY REGISTRATION DOCUMENT and return it to :-

Sonifex Ltd,
61, Station Road,
Irthlingborough,
Northants.,
NN9 5QE
ENGLAND

The registration document carries the following information for servicing :-

SERIAL NUMBER	DHY _____
COUNTRY CODE	E A U O

Safety Of Mains Operated Equipment HY02 *Digital* TBU

Preparing the Eurocard for Use

Each HY02 *Digital* TBU is shipped in protective packaging and should be inspected for damage before use. Where an item is found to have transit damage, notify the carrier immediately with all the relevant details of the shipment. Packing materials should be kept for inspection.

Connect the card in accordance with the connection details and before applying power to it, check that the power supply used has the correct operating voltage.

Equipment Safety

This equipment has been designed to meet the safety regulations currently advised in the country of purchase.

It is important to connect the mains supply in accordance with the information given. SEE BELOW. Ensure that the power supply used has the correct operating voltage and that the mains supply fuse is correctly rated. The fuse as supplied is correct for the voltage setting.

WARNING: This apparatus is intended for use when powered by the HOST UNIT INTERFACE and HY02-B power supply unit. Other usage will invalidate any approval given to this apparatus if, as a result, it ceases to comply with the edition of BS6301 to which it was approved.

WARNING: The equipment B.T. plug should only be connected with apparatus complying with BS6301 and the connection to the network must not be hard wired. Interconnection directly or indirectly with equipment ports marked in accordance with BS6301 to unmarked ports may produce hazardous conditions on the network and advice should be obtained from a competent engineer before such a connection is made.

WARNING: This apparatus **must** be earthed by means of the earth pins on the connector on the rear of the card, and the B.T. plug should be disconnected from the telecommunications network **before** disconnecting the earth. Disconnection of this earth connection may render the equipment unsafe, with a consequential possible electrical shock hazard from exposed metallic parts.

WARNING: The barriered ports 'NTTP' and 'Handset' must not be connected directly or indirectly to the unbarriered ports, 'Line Input', 'Line Output', or 'Remotes'.



Mark.

This equipment conforms to the safety regulations specified by use of the CE

WARNING : The B.T. plug should be disconnected from the telecommunications network exchange line before removing the equipment covers.

Limitation of Liability

Limited Warranty - Sonifex warrants that (a) the HY02 *Digital* SOFTWARE will perform substantially in accordance with the accompanying Product Manual(s) for a period of 90 days from the date of receipt; and (b) any Sonifex supplied hardware accompanying the SOFTWARE will be free from defects in materials and workmanship under normal use and service for a period of one year from the date of receipt. Any implied warranties on the SOFTWARE and hardware are limited to 90 days and one (1) year, respectively, or the shortest period permitted by applicable law, whichever is greater.

Customer Remedies - Sonifex's entire liability and your exclusive remedy shall be, at Sonifex's option, either (a) return of the price paid or (b) repair or replacement of the SOFTWARE or hardware that does not meet Sonifex's Limited Warranty and which is returned to Sonifex with a copy of your receipt or invoice. This Limited Warranty is void if failure of the SOFTWARE or hardware has resulted from accident, abuse, or misapplication. Any replacement SOFTWARE will be warranted for the remainder of the original warranty period or 30 days, whichever is longer.

No other warranties - To the maximum extent permitted by applicable law, Sonifex disclaims all other warranties, either express or implied, including but not limited to implied warranties or merchantability and fitness for a particular purpose, with respect to the SOFTWARE, the accompanying product manual(s) and written materials, and any accompanying hardware. The Limited Warranty contained herein gives you specific legal rights.

No Liability for Consequential Damages - To the maximum extent permitted by applicable law, Sonifex and its suppliers shall not be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use this Sonifex product, even if Sonifex has been advised of the possibility of such damages. In any case, Sonifex's entire liability under any provision of this agreement shall be limited to the amount actually paid by you for the SOFTWARE. This Agreement is governed by the laws of England.

Sonifex Ltd can not be held liable for any loss of audio data due to equipment failure.

Faults Sheet

Although this Sonifex product is manufacture to the highest standards, it is possible that minor faults may appear in the equipment over its normal lifetime. If you find any problems with the HY02 *Digital*, please contact your Sonifex distributor, or contact Sonifex directly at the following address, or fax with a copy of this completed sheet :

To :	Sonifex Ltd, 61, Station Road, Irthlingborough, Northants. NN9 5QE, UK	From: Name	Position
		Company	Address
		
		
		Tel : +44 (0)1933 650 700	Tel
		Fax : +44 (0)1933 650 726	Fax

For the Serial No. of your eurocard, see the label on the edge connector of the card .

HY02 <i>Digital</i> Serial No.

Please describe the error in as much detail as possible (for example what you were doing when the problem occurred, what actually happened, etc).

Description of HY02 <i>Digital</i> Error

Also, if you have any suggestions for additions or upgrades to the HY02 *Digital* unit , we would like to hear what they are :

Additions that I Would Like to See

1. Introduction & Installation

1.1. Introduction

The HY02 *Digital* telephone hybrid is a series of equipment presented as rack mounted single and twin channel units, or as a single channel eurocard. A single channel ringing detector is also available :

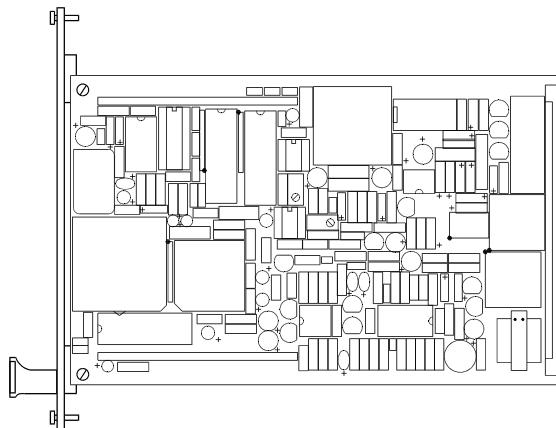
- DHY 02S** Single automatic TBU, rack mounted with PSU.
DHY 02SR Single automatic TBU, with ringing detector, rack mounted with PSU.



- DHY 02T** Twin automatic TBU, rack mounted with PSU.
DHY 02TR Twin automatic TBU, with ringing detector, rack mounted with PSU.



- DHY 02EC** Eurocard version, without ringing detector.



- RD 02EC** Eurocard ringing detector for use with DHY 02EC

This handbook covers the DHY 02EC, eurocard version. If you are using the eurocard TBU without the ringing detector card connected, please ignore the section of this handbook which deals with ringing detector. The serial number of this unit can be found on the connector at the rear of the card.

1.2. Description

The telephone hybrid is a two wire to four wire converter which provides the interface between a caller on the telephone line and the input to the mixing desk. Built to a very high specification, it is simple to install and automatically adapts to line conditions and programme content. Analogue signal limiting, controlled from the DSP, is used in the send and receive paths to ensure that signal break-up and severe overload problems do not occur.

Both the input and the output are transformer balanced providing complete isolation. The unit has a line connect control facility and the equipment is fitted with K-break and dial tone disconnect as standard. All connections are via DIN 41612 Type B, 32 way 'A' loaded edge connector.

By using a high power DSP and a high quality 16 bit dual codec, the HY02 *Digital* gives some of the best audio figures available - it provides full adaptive echo cancellation to 28msec and gives unwanted sideband rejection figures of 69dBu on tone, reference peak output of +8dB. The HY02 *Digital* has been designed to achieve the best possible audio performance from a telephone line. The unit ensures that the dynamic range is as large and the distortion and noise are as small as possible.

The following product description is necessary for BABT approval and provides information on the connection and operating conditions of the units :

1.2.1. Manufacturer

Sonifex Limited,
61 Station Road,
Irthlingborough,
Northants,
NN9 5QE
United Kingdom

1.2.2. Equipment Type

HY02 *Digital* Eurocard telephone balance unit.

1.2.3. BABT Approval Number

S /3619/23/L/501793

1.2.4. Functions

The HY02 Digital Eurocard Telephone Balance Unit is suitable for use with the Host Unit Interface for connection to B.T. exchange lines with a series connected telephone at the 'Handset' port. The hybrid unit is used as a four wire to two wire converter. Incoming calls received at the handset may be diverted to the hybrid unit and produce a 'telephone' signal at the output of the unit. 0dB signals presented at the line input are transmitted to the telephone line only. The HY02 Digital Eurocard automatically balances the telephone line.

1.2.5. Specified Systems

The HY02 Digital is suitable for connection to any exchange line forming part of a Public Switched Telephone Network, PSTN, or a Relevant Branch system for PSTN lines or any extension. This equipment is not suitable as an extension to a payphone.

A definition of a Relevant Branch System for PSTN is given in BS6789 : Section 6.1: 1986 clause 2.4 including the NOTE to that clause.

1.2.6. Ringer Equivalence Number

The REN=1 marking on the front of this equipment relates to the performance of the apparatus when used in combination with other items of apparatus.

The REN indicates the maximum number of items that should be connected simultaneously to the line. This equipment may be connected with series apparatus up to REN = 4 maximum.

1.2.7. Accessory Ports

1.2.7.1 Barrired Ports

The Handset series connection complies with BS6301.

1.2.7.2 Accessory Ports

- a) Line Input
- b) Line Output

1.2.8. Conditions

This apparatus is not designed for use under controlled conditions of temperature and relative humidity.

1.2.9. Series Connection

This apparatus when connected into the loop connection between the main apparatus and the PSTN introduces a voltage drop at a current of 40mA of 0.300V.

The apparatus should not be used in conjunction with other series connected apparatus such that the aggregate declared voltage drops together with that of any relevant wiring at 40mA, exceeds 2.0 volts.

1.2.10. Facilities

This apparatus has been approved for use as a telephone hybrid unit (four wire to two wire converter) and for use with a series connected simple telephone or ringing detector type RD 02EC. Any other usage will invalidate the approval of the apparatus if as a result it then ceases to comply with the standards against which approval was gained.

1.2.11. Statutory Mark

Approved for connection to telecommunications systems specified in the instructions for use subject to the conditions set out in them.

1.3. Specification

Feature	Value
Clean feed input line	10k Ω balanced 0dB
Clean feed limiting input	+6dBu
Bandwidth to Telephone line	250Hz - 3500Hz, -3dB ref 1kHz
Telephone line impedance	Nominally 600ohm, reactive
Telephone line impedance range	300 Ω to 1500 Ω
Output	Balanced floating 0dBu 50 Ω
Rejection Ratio	Typically 69dB reference peak level of +8dB
Echo Cancellation	Network cancellation to 28msec
Power	\pm 15V regulated.
Dimensions	Eurocard : 160mm, Height 3U, Width 8E
Connections	32 Way Din 41612 Type B, 'A' loaded

1.4. Installing the HY02 Digital TBU

Connect the power and earth connections as per the information given in the Warranty and Safety Information section of the handbook. The hybrid unit should be connected with reference to Figure 1-1 below.

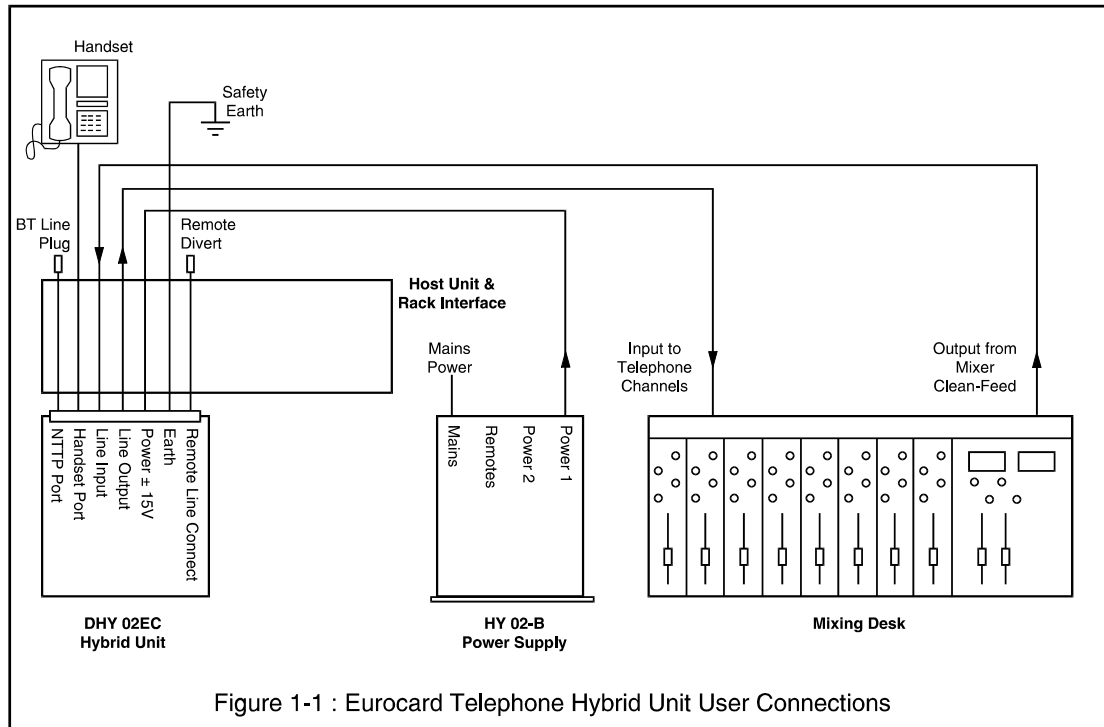


Figure 1-1 : Eurocard Telephone Hybrid Unit User Connections

The telephone line NTTP port should be connected using a BT 6/502 cable mounted connector into a suitable BT wall jack socket. A simple telephone handset can be used to take and make calls when plugged into a handset connector BT 605A.

The Line Input is balanced bridging and will accept normal signals at 0dBu peaking to +8dBu from a sound mixer 'clean feed'. The input circuitry to the HY02 Digital has a very effective limiter which will prevent high level overloading problems.

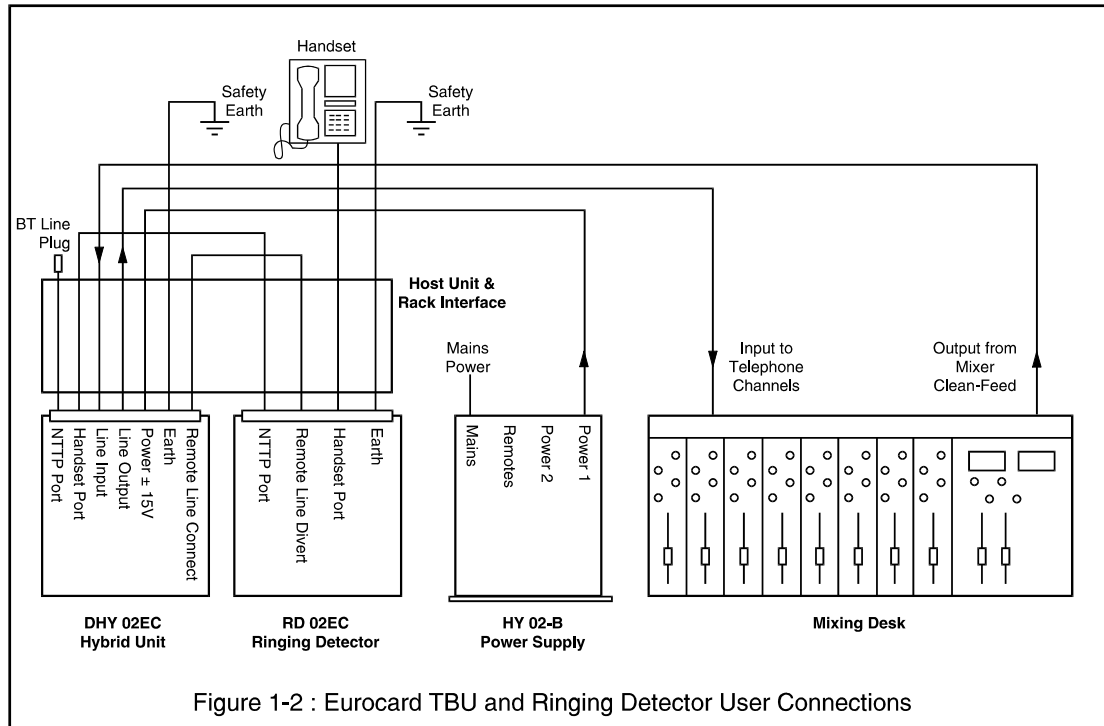
The Line Output connection will deliver a balanced/floating low impedance signal of 0dBm from the telephone line. The output of the digital hybrid unit is normally 0dBu from a balanced source of 50 ohms or less across the useful bandwidth of the equipment. The bandwidth is restricted by the line conditions between 250 Hz and 3.5 kHz. The output stage is capable of driving into 600 ohm loads at up to +8dBu. It is not necessary to terminate this output.

Isolation of better than 69dB is created between the input and output connectors when the hybrid unit is functioning on an exchange line. The equipment may require some adjustment to work with PBX systems.

The power supply needs $\pm 15V$ dc to power the electronic hybrid processor from a 230V, 50Hz ac supply. The earth connection provided at the rear of the equipment provides protection for the user against dangerous line fault conditions. A Remote Line Connect (Divert) switch should be connected to control the acceptance and release of calls.

There are jumper gain controls available to the user for setting both the Receive and Transmit levels through the equipment.

If connecting the DHY 02EC eurocard to a eurocard ringing detector, please configure the connections as per Figure 1-2.



The earth bond at the edge connector must be connected to a technical earth to ensure the safe operation of the equipment under all line conditions.

1.5. Using the HY02 Digital

1.5.1. Receiving a Call

With the equipment connected as in Figure 1-1, calls may be received and detected by the ringer in the telephone handset. To receive the call, lift the handset and establish contact with the caller. The call may be diverted to the telephone hybrid means of the Remote Line Connect Switch (Pin 30). The hybrid unit will now act as a 4 wire to 2 wire converter with a signal input at the Line Input and telephone signal output at the Line Output.

The call may be cleared by using the Remote Line Connect switch, or by means of the K-break provided in the equipment. Automatic line clearance is provided when the caller hangs up, if jumper JP2 is set (default condition).

Alternatively, the ringing detector card, RD 02EC, may be connected to the series connection 'Handset' of the DHY 02EC and the handset connected to the 'Handset' connection of the RD 02EC (See Figure 1-2). Ringing tone will energise the Remote Line Connect switch through the interconnection between the two units. The call will then be picked up automatically and passed to the telephone hybrid.

With both auto-answer and auto-clearance in use, call handling can be completely automatic in operation.

1.5.2. Making a Call

To initiate a call, lift the Handset and dial the required telephone number. When the call has been established, use the Remote Line Connect switch and the call will be handed over to the telephone hybrid unit. To clear the line at the end of the call, press the Remote Line Connect switch.

Please note that any adjustments and settings should be carried out by competent engineering personnel.

Questions & Answers

This section of the handbook answers some of the popular questions asked about the HY02 *Digital* eurocard unit and the way that it operates. If you have any questions regarding the operation of the HY02 *Digital*, please contact your nearest distributor, or Sonifex directly.

Q : Why do I need a telephone balance unit ?

A : To convert a two wire telephone pair (duplex) to a four wire (2 simplex) one input pair and one output pair.

Q : What is a mix-minus signal and why do I need one ?

A : A mix-minus signal (also called a clean-feed) is an output from the mixing console which includes signals from all of the audio channels except the channel that is allocated to the telephone line. It is the signal that is used in the TBU send input, which is sent to the caller on the telephone line.

There are two reasons why the clean-feed signal is needed : Firstly, the TBU is designed to separate the caller audio from the desk output audio, with an output consisting mostly of the caller audio. If the caller audio is sent to the TBU send input, a feedback loop is created (causing howling on the line) and the hybrid can not separate the two signals. Secondly, the caller should hear what the other listeners are hearing and not hear themselves.

Q : What are the main advantages between a conventional analogue hybrid and the HY02 Digital eurocard ?

A : There are two : The main advantage is that the HY02 *Digital* rejects signals equally across its frequency band which results in a much better total rejection ratio. The second advantage is that the HY02 *Digital* can handle line echo and reflections of up to 28msec. This provides dramatic improvements on rejection ratios over satellite links.

Q : Can I use open speakers with the HY02 Digital ?

A : Yes. Due to the echo cancellation, the HY02 *Digital* can cope with a high level of acoustic feedback without it becoming unstable.

2. Circuit Description & Controls

The HY02 *Digital* Eurocard Telephone Hybrid consists of TBU circuits mounted on a eurocard sized PCB and usually housed in a host unit rack. The card must be used with a BABT approved power supply to keep compliance - isolation is achieved by means of the barriers created at the power supply and the hybrid electronics.

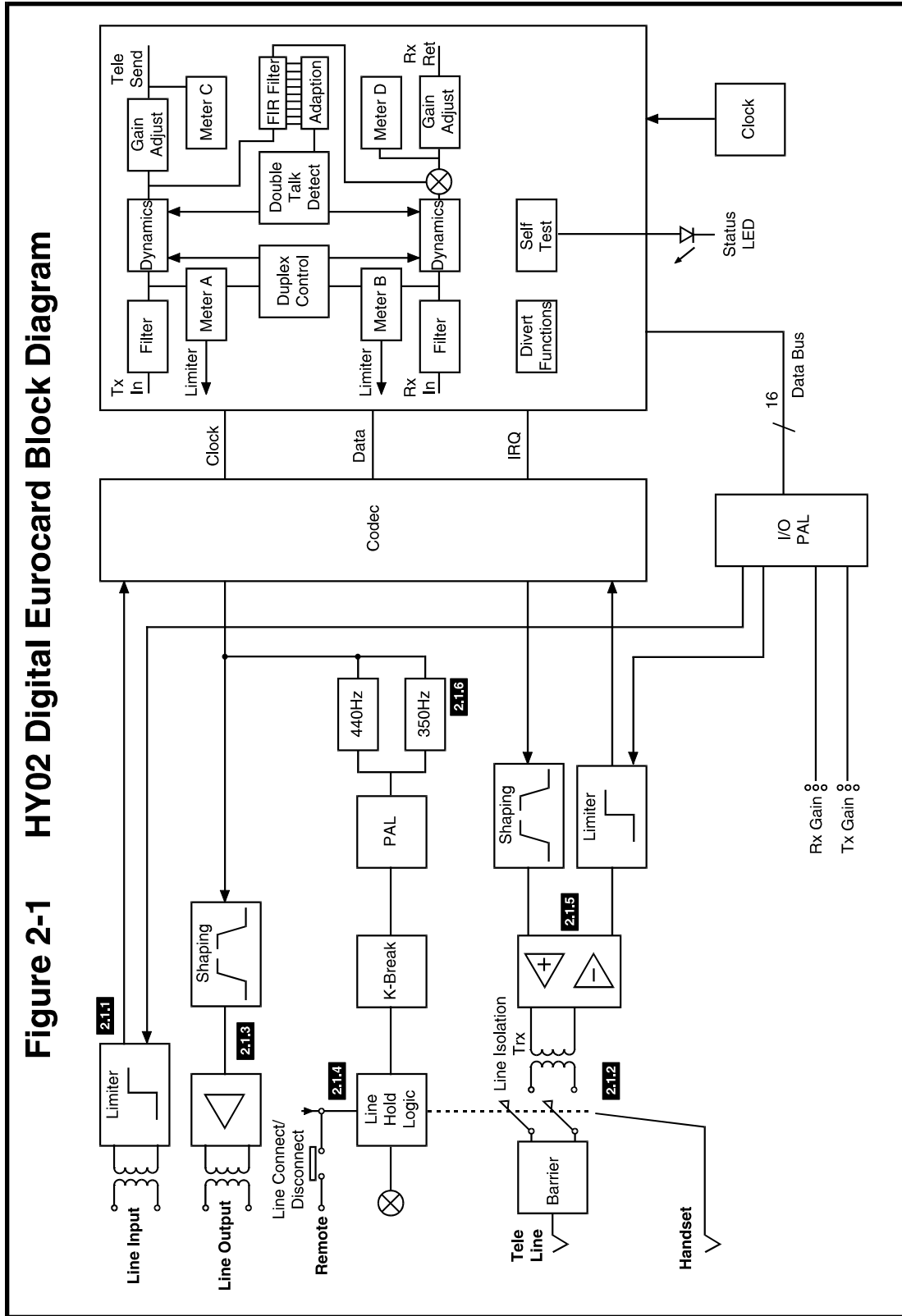
2.1. Electronic Digital Hybrid Unit Circuit Description

The electronic digital hybrid unit comprises the following sections (see block diagram, Figure 2-1).

- 2.1.1 Input circuits and limiter.
- 2.1.2 Telephone line barrier and transformer.
- 2.1.3 Output circuits.
- 2.1.4 Divert switch logic.
- 2.1.5 Line balancing electronics.
- 2.1.6 Dial tone detect circuits.
- 2.1.7 Displays

2.1.1. Input Circuits and Limiter

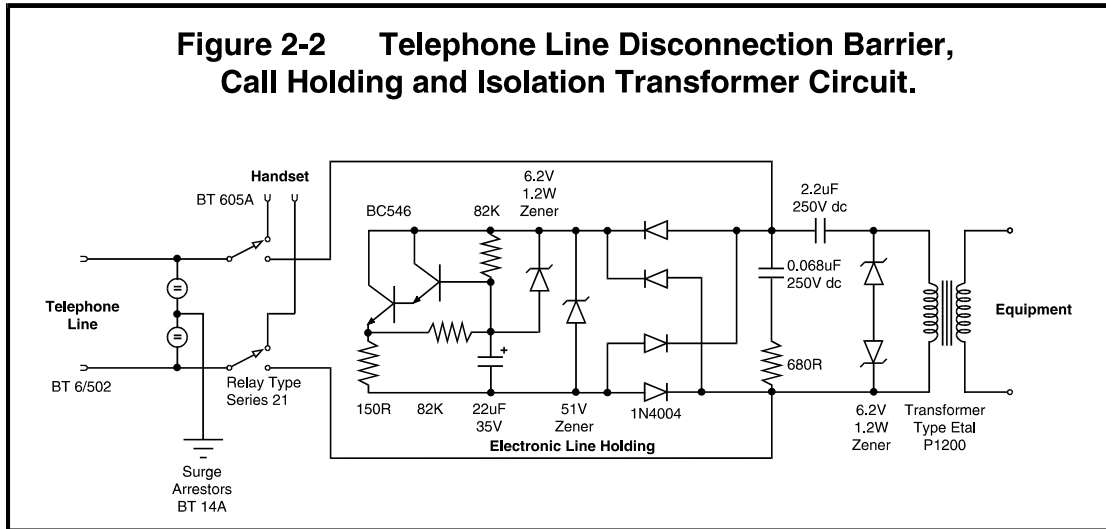
The line input connection at PL1 pins 16 & 17 is coupled directly to the line bridging input transformer TR2. The input impedance is greater than 10K ohms balanced floating with a high common mode rejection ratio. The input transformer is coupled to the limiter transistors Q11 and Q12 and amplifier Q3b via R25, C10, C11 and R27. The limiter output delivers full bandwidth signals which drives the digital processor. Analogue signal limiting controlled from the DSP is used in the send and receive paths to ensure that signal break-up and severe overload problems do not occur. The telephone send circuit drives the line via a transformer/capacitor/divert relay combination. The receive circuit uses an independent transformer coupled bridging circuit. This is connected to the send circuit in two wire mode and to a separate input for four wire operation. An analogue sidetone cancellation network is switched in if the board is 'on-line' and in two wire mode.



2.1.2. Telephone Line, Barrier and Transformer

The telephone line port is a two wire connection into the apparatus through a line cord and jack BT 6/502, with a surge arrester BT 14A from the A and B wires to earth. The line connection is switched by a divert switch that controls a relay between the hybrid unit and the handset connected through a BT 605A connector.

The line is held, on the equipment side, by an electronic line holding circuit Q9, Q8 and Q7, the A leg fed through a 2.2 uF 250V d.c. blocking capacitor to the line transformer TR1 (ETAL P1200). A pair of zener diodes arranged in a back to back configuration across the primary of the line transformer, are arranged to act as overvoltage protection. The line transformer is designed to meet BS 6305. Figure 2-2 shows a schematic diagram of this part of the circuitry.



2.1.3. Output Circuits

The output from the codec Q19 is presented at balanced line level via a servo balanced output stage. Amplifier Q2d and transistors Q14 and Q15 form a low impedance push-pull amplifier driving the output balancing transformer TR3. The diodes D16 and D17, R39 and R40 form a bias chain for the drive transistors. The input at Q2d is filtered by R53 and C27 a simple low pass filter.

The balanced output at TR3 is less than 50 ohms at the frequencies used and has a high common mode rejection. The output signal at TR1 consists of the telephone line signal only, with the local clean feed content nulled out to better than -69dB ref +8dB peak output.

2.1.4. Divert Switch Logic

With the system unenergised the logic connects the telephone line to the handset through relay RL1 relaxed contacts.

The logic circuits Q1a and Q1b change the state of the relay contacts via Q23, Q19, Q1f and Q5, diverting the telephone line to the equipment, when the divert switch is activated. The logic is edge triggered and will accept remote commands. This logic also drives the indicator lamp at the switch and remote lamp contacts.

The logic holds the relay in the divert condition until either power is removed or the switch is operated again. K break and dial hang up tone will also untrigger the latch when required to do so.

A signal from the logic operates input muting when the handset is in use preventing spurious output signals at the equipment.

2.1.5. Line Balancing Electronics

The DHY 02 is designed to achieve the best possible audio performance available from a telephone line. To this end, a high quality 16 bit dual codec is used. The equipment ensures that the dynamic range is as large, and the distortion and noise are as small as possible.

The send audio signal from the codec is processed via the DSP before being sent to the telephone line. The send signal is checked for excess level and the input analogue signal is limited as above if the signal is found to be overloading. The signal is then high-pass filtered, and, if enabled, acoustic cancellation is implemented.

2.1.5.1 Duplex Control

Transmit/receive path level locking :

Off position : No processing.
Low position : +12dB dynamic levelling.
High position : +24dB dynamic levelling.

Attack and release time 1dB per 5msec. Hysteresis 8dB for no processing.

2.1.5.2 Adaption System

Network cancellation of 28ms. Double-talk detection and normalised adaptive FIR system used with pink noise cancellation

2.1.5.3 Send Circuit

Transmit set to low :

Maximum output (soft limited)	0dBm
Sensitivity for max output :	+6dB
Maximum input level :	+20dB
Distortion at -1dBm to line :	0.1%
Output noise to line :	-71dB
Tx LED sensitivity :	-14dB on, -17dB off
Frequency response :	-3dB at 250Hz, flat until 3.5kHz

Dynamic control profile as below :

Input	Output
+20dB	0dB
+10dB	0dB
0dB	0dB
-10dB	-10dB
-20dB	-22dB
30dB	-41dB
40dB	-57dB
50dB	-66dB

Attack: 125mS, decay, 1dB per 5mS

Transmit set to medium :

As above, but input 0dB for 0dBm to line.

Transmit set to high :

Maximum output level to line (soft limited) : +6dBm
 Tx LED sensitivity : -7dB on, -10dB off
 Output noise to line : -66dB

2.1.5.4 Receive Circuit

Receive set to low:

Gain : +9dB
 Maximum output : +8dB (soft limited)
 Distortion : 0.1% before limiting
 Maximum input level : 20dBm
 Noise : -66dB (-77dB off line)
 Rx LED sensitivity : -14dB on, -17dB off at output
 Frequency response : -3dB 250HZ, flat to 3.5 kHz.

The cancellation uses FIR filters with a normalised signal dependent adaption algorithm. The adaption is disabled during double-talk and when the signals are too low in level. The adaption coefficients are held digitally and are not subject to drift when no signals are present. Typically 40dB of rejection is achieved with real signals although 60dB rejection can be measured using test signals into dummy lines. Send and receive levels are set up by on-board links.

Although the board works in full duplex mode, links can program signal dependent half duplex operation; this enhances the overall sidetone rejection/stability with little degradation to the apparent full duplex operation.

2.1.5.5 Hardware Control

The DSP is used to control all facets of the operation of the board. On power up, the digital devices are checked for correct operation and a status led flashes if errors are found. The DSP reads the onboard links and sets the operational mode signal levels accordingly. The DSP also controls the divert status of the board via the codec auxiliary data I/O channel. The signals are software 'debounced' for stable operation.

The send and receive LEDs are processed via the DSP. These have hysteresis built in to minimise 'chattering'. The divert relay and two/four wire mode control is driven via the DSP.

The signal is checked for overload, and digitally limited if needed. The 'Tx LED' is turned on if the outgoing signal is above -14dB and the Tx signal is gain reduced if found to be below -24dB. The Tx level is adjusted before being sent to the codec send port. The signal is processed in 16/32 bits throughout, to maintain good audio performance. The receive signal from the codec is processed via the DSP before being presented to the output. The receive signal is checked for excess level and the input analogue signal is limited if the signal is overloading. The signal is then high-pass filtered and, if enabled, network cancellation is implemented.

The signal is checked for overload and digitally limited if needed and the receive is disabled if the board is 'off line'. The 'Rx LED' is turned on if the signal is above -14dB and signal is gain reduced (i.e. noise reduction is introduced) if it is below -24dB. The signal is also gain reduced if levelling is desired, and the send signal is dominant. Receive level is adjustable from 9 to 21dB.

2.1.5.6 Digital Cancellation Control

Fixed sidetone cancellation occurs in two wire mode prior to DSP processing. Full adaptive network cancellation is achieved by DSP means. Echo cancellation is 28ms.

2.1.6. Dial Tone Detectors

Dial tones presented to the equipment at the termination of a call, (hang up tone) can be detected by the equipment and can be used to disconnect the HY02 *Digital* from the telephone line as an automatic process.

Since there are several hang-up tones in use worldwide, there are jumper settings at JP8, JP9 and JP10 to select the various possibilities :

- a) Single or dual tones
- b) Pulsed or continuous tones
- c) Long or short cadences.

The tone frequencies are detected by two independent tone decoders Q17 and Q18 each with centre frequency setting presets RV2 at 350 Hz and RV1 at 440 Hz.

Detected signals are processed by the logic at Q23 and present an unlatching signal to the disconnect circuitry at Q6.

Alternatively when the caller hangs up the line voltage increases. This is detected by Q7 and coupled by opto-isolator Q4 which creates a disconnect signal at Q6. This disconnection is the K break.

2.1.7. Displays

There are three LEDs mounted directly on the circuit board which provide information about the transmit and receive signals and status information :

The LD1 Status LED indicates any error conditions at switch on by means of a flash code :

Number of Flashes	Error
3	Q21 error.
4	Q22 Test 1 error.
5	Q22 Test 2 error.
6	Q19 Codec IRQ error.

The flashing stops after approximately one minute and then begins a high speed read/write of the device in question. If any of these errors should occur, please contact your nearest Sonifex distributor.

LD2, the transmit LED, and LD3, the receive LED, are on whenever transmitting and receiving respectively.

2.2. Alignment Controls

The following alignment controls and jumpers are provided within the equipment for setting the general operating parameters. For the position and layout of the preset alignment controls, see Figure 2-3, overleaf. For normal operation of the equipment, these controls will not need to be altered. "Set" or "Enabled" implies that the jumper is on.

Do not adjust these settings without consulting a technical information file.

2.2.1. Jumpers

- JP1 Controls whether the Remotes connections are actuated by momentary or permanent contacts. Set over 1 & 2 for momentary. Set over 2 & 3 for permanent.
- JP2 Set for line disconnect (default). If the caller hangs-up, this will drop the line off using K-break.
- JP3 Transmit Gain Adjust. The level of the output sent by the unit depends on which of the three settings is selected. With no jumper set, -6dB is sent to the line for a reference 0dB input signal. When set over 1 & 2, or 2 & 3, -12dB and 0db respectively are sent to the line (i.e. ± 6dB change in level).

Jumper Setting	Transmit Level (ref 0db input)
1 & 2	-12dB
None (Default)	-6dB
2 & 3	0dB

- JP4 Factory set on pins 2 & 3 - do not adjust.
- JP5 Receive Gain Adjust. The level of the input received by the unit depends on which of the three settings is selected. With no jumper set, a -12dB signal received is output at 0dB. Setting a jumper over pins 1 & 2, or 2 & 3, adds +6dB and +12dB to the level, respectively. Set the level so that the meter readings peak at the 0dB scale mark.

Jumper Setting	Receive Level (ref 0dB output)
None(Default)	0dB
1 & 2	+6dB
2 & 3	+12dB

- JP6 Factory unset - do not adjust.
- JP7 Factory set on pins 1 & 2 - do not adjust.
- JP8 Controls disconnect tones : Set for single tone, unset for dual tone

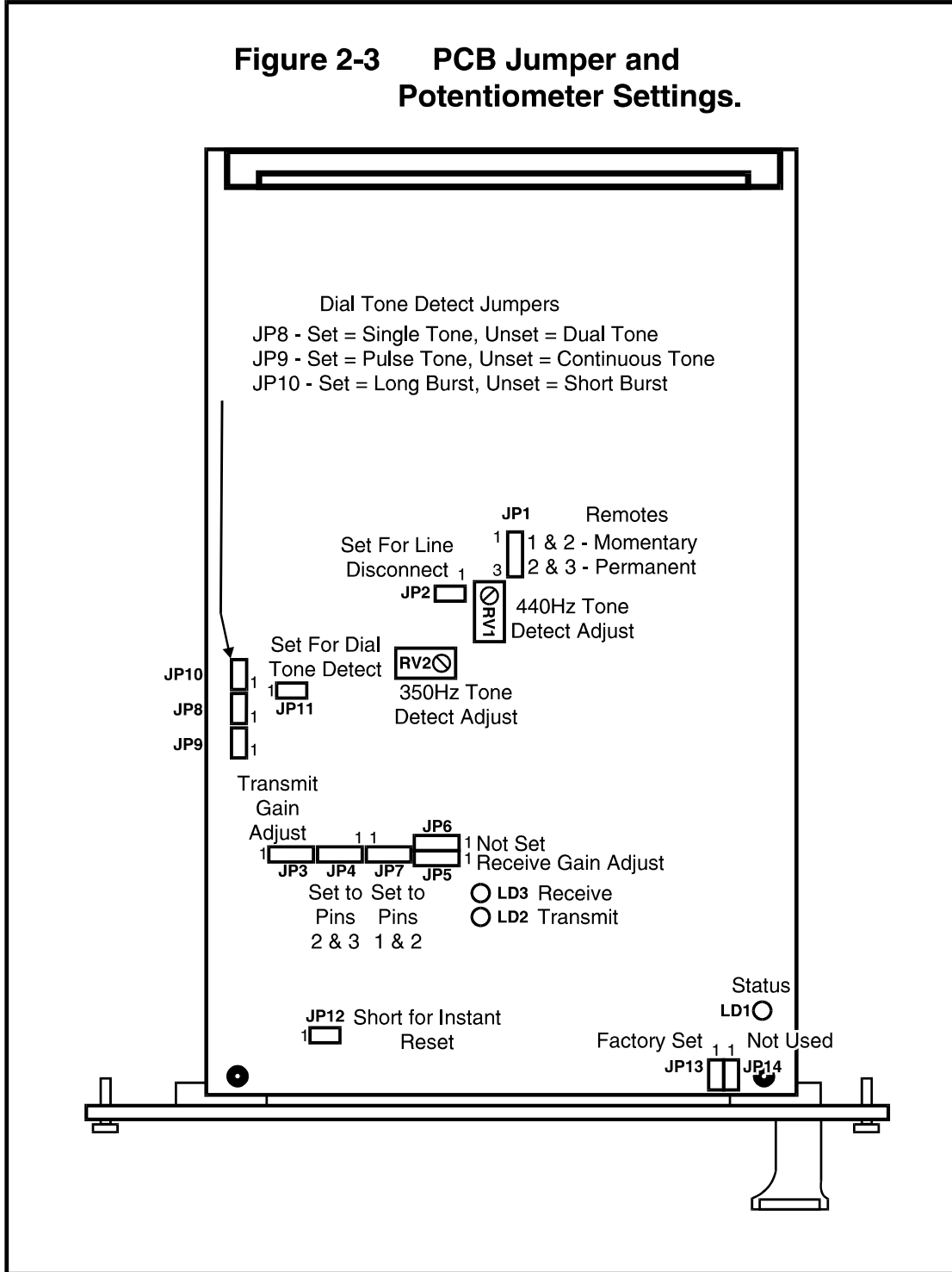
(UK).

- JP9 Controls disconnect tones : Set for pulse tone (Belgium, France), unset for continuous disconnect (UK).
- JP10 Controls disconnect tone burst : Set for long burst (4 secs), unset for short (2 secs) disconnect tone burst (UK). It is the length of time that the line tone has to be present before the automatic disconnect operates.
- JP11 Set for dial tone detect (hang up tone). If JP2 is connected and the K-break has failed, this will automatically hang the line up.
- JP12 Link for instant reset.
- JP13 Factory Set
- JP14 Not used

2.2.2. Preset Potentiometers

- is
- RV1 This sets the frequency of the primary 440 Hz disconnect tone. Range 250 - 550 Hz.
 - RV2 This sets the frequency of the secondary 350 Hz disconnect tone. Range is 250 - 550 Hz.

Figure 2-3 PCB Jumper and Potentiometer Settings.



3. Connection Details

All of the connections are made to the 32 Way DIN 41612 connector, PL1, on the rear of the PCB :

3.1.1. Pin Numbers

Pin 1 :	N/C
Pin 2 :	BT Line B
Pin 3 :	N/C
Pin 4 :	BT Line A
Pin 5 :	Earth Recall
Pin 6 :	Ringer Loop
Pin 7 :	Ringer Loop
Pin 8 :	Earth Recall
Pin 9 :	Handset A
Pin 10 :	Handset B
Pin 11 :	N/C
Pin 12 :	N/C
Pin 13 :	N/C
Pin 14 :	N/C
Pin 15 :	N/C
Pin 16 :	Line Phase
Pin 17 :	Line Non-Phase
Pin 18 :	0V
Pin 19 :	N/C
Pin 20 :	Output Phase
Pin 21 :	Output Non-Phase
Pin 22 :	0V
Pin 23 :	N/C
Pin 24 :	+15V
Pin 25 :	N/C
Pin 26 :	-15V
Pin 27 :	0V
Pin 28 :	Protective Earth
Pin 29 :	Protective Earth
Pin 30 :	Remote Line Connect Switch
Pin 31 :	Remote Line Connect Lamp
Pin 32 :	0V

IMPORTANT NOTE : For full port protection to work, the protective earth must be connected.

3.1.2. Power Requirements

The DHY 02EC is approved for use with the HY 02B power supply unit. The d.c. power requirements of the DHY 02EC are :

- +15V regulated @ 160mA
- 15V regulated @ 160mA

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