DH400 Digital Hybrid

Digital Phone Hybrid with DSP echo canceller

User's manual

Last revision: Jan 2014

Contents

ADVERTENCIAS

AC **Voltage**	The unit cans wok with 110 or 220 VAC. A voltage switch on the rear panel selects the correspondent voltage. **ALWAYS CHECK THIS SELECTOR BEFORE PLUG IN.**

CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN In order to reduce the risk of electrical shock, do not retire the covers of the cabinet. The internal pieces do not require maintenance of the user. Refer the technical maintenance to qualified personnel.

	El cable provisto con el equipo posee conexión a tierra. No lo reemplace ni use adaptadores. ASEGÚRESE DE CONTAR CON UNA TOMA A TIERRA CONFIABLE.

	The exclamation icon within a triangle that appears in this manual is intended to alert the user to the presence of important instructions on the operation and maintenance (servicing) of the equipment.

	The pencil icon that appears in this manual is to alert the user to the presence of notes, suggestions and examples about the operation.

SECTION 1 - **Overview**

1.1 Overview

The Solidyne DH400 manages 4 telephone lines, with support to one cellular phone. The audio signal is digitized and processed using 4 DSP (Digital Signal Processor).

The DH400 is driven by a microcomputer, which supports several work modes. For example, it can manage four telephones sets for a radio call center. The local phone operator can use a PC to enter information about the calling, which is immediately transferred to the entire radio PC network, using our free DH400 software. With a simple touch of the 'Flash' button at the telephone set, the telephonist HOLD the calling without disturbing to the on-air operator. Then, the radio announcer can put on-air the calling, knowing beforehand all the basic information about the caller.

It is possible to change the lines status (off, hold, on-air, conference, etc.) from any LAN terminal running DH400 software, using a mouse, the keyboard or a touch screen.

DH400 is able to work full automatic, 24 hours a day, taking the phone lines, with customized welcome message, and recording automatically the 4 lines simultaneously. The recording is of high quality, unlike the PC telephone answering machines.

At the night, a single DJ-operator can manage the transmission. DH400 auto-answer attends the lines with the welcome message and then toggle it on HOLD status. Dj send the callings on the air pressing the NEXT button. The oldest calling on-hold will be aired first. In all cases DH400 can be operated from its frontal panel or through PC software.

Great audio quality: The absence of local voice return due echo cancellation algorithms, allows for excellent audio quality. And even better, the internal VQR (Voice Quality Restoration) processing allows to restore the lows and improve the mid-high frequencies of the telephonic voice.

The hybrid automatically adjust its rejection ratio (in two seconds) and reaches values of 45 to 60 dB. This high values achieves using a technology called *digital echo cancellation*. This high rejection allows to the user to hear at the caller using loudspeakers in large radio studios, auditoriums or television sets. In addition, DH400 provides phone line feedback cancellation and acoustic echo cancellation, allowing manage the sound into videoconferencing environments, something impossible with analog hybrids.

1.2 What is the DSP echo cancellation?

A telephonic hybrid allows to separate the remote signal (the caller) from the local signal, due to both audio signals are mixed over a pair of cable. that returns from the caller to the console, preventing them from mixing. If you are using 2 pairs of wires all would be very simple (one way to go and another to return) but using only one pair, both signals are mixed. This occurs when we talk to the person remotely; a part of that signal returns with bad audio quality, affecting the local DJ voice on air.

Conventional Hybrids use an internal network that simulates the impedance of the phone line. This is only approximate and allows 15 to 30 dB of separation of signals. It is named rejection. The digital system converts the analog audio signal into a full digital one. It opens the possibility of a processing at the digital domain, for a perfect simulation of the real phone line. This allows not only simulate impedance, but time delays to create an exact replica of the returning signal. Then, we can sum it with inverted phase to cancel almost completely the annoying signal return.

The heart of the digital echo canceller is a FIR, taped delay line filter, of 256 steps. Each of them has a delay and contributes to the total sum through a variable multiplier coefficient. The output of this filter is compared with the input that we sent to a phone line (the speaker's voice from the radio) and automatically and dynamically these 256 coefficients are modified,

using a LMS algorithm, to ensure that the response of this artificial line is exactly like the real telephone line. This adjustment is done in a couple of seconds at the conversation start.

The output of this line is then summed with inverted phase, to completely cancel the unwanted return.

The technology, created in the U.S. for satellite communications, is now available to your radio, incorporated into the DH400.

1.3 Recording

You can record automatically 4 lines simultaneously on PC. The recording on the PC can be solved with conventional software, or you can choose a module of Solidyne Autorec, which resolves directly to MP3 recording four channels simultaneously.

1.3 Control from PC

DH-400 can be controlled using a computer, from a software interface. This software supports multiple workstations. Each terminal may or may not have access to the control of the hardware. In addition, using the software the operator or producer can enter information about each calling (caller's name, reason for the call). This information appears on every DH-400 terminal (on-air operator, Studio).

The software operates in a similar way to the front of the unit. It is possible to answer calls one by one, or put them in conference from anywhere in the network on which you installed the software DH-400. The telephonist transfers the communication to the operator by pressing the 'flash' the phone.

1.2 Auto-answer

The DH-400 also allows manage calls automatically. Who calls hears a welcome message and stays waiting listening the audio program.

During the night, one Dj-announcer can manage the radio. DH-400 answer the 4-lines, plays the welcome message and leaves them on 'Hold'. The Dj-announcer is taking calls on hold with a simple touch of a button. Or can take several simultaneously to make a conference. In all cases, the DH-400 can be operated from the front panel or via software.

2.1 Screen

Shows the status of each line. By pressing "Display" the screen change to show the levels of audio for send and return.

2.2 Phone line buttons

Controls the phone lines. When a call enters the hybrid, the phone line button flashes quickly with each ring cadence. By pressing the button the communication is on air (if the corresponding channel on the console is enabled). When a call is on the air, the button remains lit.

If, while a line is on-the-air the button is pressed again, this line toggle to HOLD mode. The caller remains listening the program audio but not on-the-air. In Hold mode buttons flashes slowly.

To end the call and release the line (while on the air or on hold), press and hold by two seconds the correspondent line button.

RECUERDE

Line buttons can adopt the following states:

- **Off:** unused line
- Double flashing quickly: RING
- **Regular quickly:** HOLD
- **Short flash each 2 secs:** Indicates that the associated phone is off hook.
- **On:** Line on-the-air.

The button 'Next'

This button sends on-the-air the Hold callings, according to the other with they arrives.

When you press NEXT, currently on-the-air line is cut and the line on hold with longer waiting time is aired.

2.3 Managing callings

A calling can be answered in many ways:

2.3.1 From production phones

Each phone line accepts an associated phone that is connected to rear panel of the DH400. This means that we can have 4 phones associated with each DH400.

When a telephonist or production assistant answers a call **from a phone set connected to DH400**, can transfers it to the on-air cabin by holding FLASH on the phone. The hybrid takes the calling (hold), and the caller listen the on-air audio program. The telephonist may have a PC running the software DH-400 to enter information about the calling, which will be displayed in the others PCs like Control Room and Studios (which obviously must also have installed and running the DH-400 software).

2.3.1.1   Operative procedure

- While the phone remains off hook, you can not take the line with the hybrid. The calling can only be transferred by pressing FLASH (there is a safety time of 3 seconds after you pick up the phone until you can press flash). The hybrid status displays "Phone" and the line button flash with slow cadence (2 seconds), indicating the associated phone is off hook.

- When transferring the call, it is retained by the hybrid, and the associated phone is switched off until the line is released (OFF).

- To retake with the associated phone a call on hold, pick up the phone and release the line in the hybrid (OFF). Remember that you can command the hybrid via software from remote locations. In order to return the call to the hybrid, press Flash on the phone.

2.3.2 From DH400

The operator can answer a calling **directly from the DH-400**, by pressing the button of this line, which will be flashing fast. In this case the line is directly on-the-air, if the correspondent channel is open at the console.

If the console allows, the operator can talk to the caller using a talk-back circuit. If the console does not have this feature, answer the call pressing the 'PHONE LINE' button twice, in order Hold the calling (the button will be flashing), and talk using the built-in microphone (speakerphone mode).

DH-400 can answer the call automatically *(auto-answer mode)*. DH-400 plays a welcome message and toggle to hold.

2.3.3 Generate the calling from the radio station

To make a calling from the radio station, proceed as following:

- Dial the number using the a telephone connected to DH400.

In case you have to hang to redial, note that when you hang a phone connected to PBX of any brand (Siemens, Ericsson, Panasonic,etc.) the hook switch must be pressed by 2 seconds or more. A fast touch on the hook switch will cause that the PBX interprets you want to transfer the calling (FLASH). DH400 works like a PBX and therefore you should take the same precautions.

- Press "Flash" to transfer the calling to the hybrid. The phone line remains on HOLD with program signal.
- Hook the associated phone.
- While the line is on hold at DH400, the associated phone is disconnected.
- When the calling is on-the-air, the associated phone stays disconnected, to avoid that interferer on-the-air accidentally.

To retake from the associated telephone a calling on HOLD, hang up the phone and release the line at the hybrid.

The associated phones must dial with DTMF. Do not use telephones with PULSE dialing, since can cause an erratic behavior of DH400.

2.4 Auto-answer

When this feature is enabled (button pressed) the hybrid automatically answers incoming calls in any of four phone lines.

After answering, it plays the welcome message recorded internally in the hybrid, and the line goes to HOLD mode. The listener is listening to the program audio until the operator sends the call on the air.

Auto-answer takes effects over lines working in "normal" mode. Lines working as "recording" or "Tele-vote" mode are always auto answered.

2.5 Return to phone line

Most of the existing analogue telephone hybrids on the market today, were designed over 30 years ago for analogue telephone exchanges (PBX). Solidyne hybrids, however, have been recently designed for private or public telephone exchanges today, which are fully digital.

The new technology Hybrids are recognized because **they have no control of air return level** to phone line. This is because inside the hybrid Solidyne uses an audio processor for return signal that includes AGC, peak limiter & audio signal filtering. Therefore **the return is automatically adjusted** during the transmission and its level is the maximum allowed by the modern digital telephone exchanges.

If you want to check the return level to phone line, you must use a oscilloscope to be placed in parallel with the telephone line and must verify that the signal is 2 volts peak to peak.

Please note that above this level the return can produce problems that will cause intermodulation distortion in the audio signal that goes to air. So in Solidyne hybrids we use a processed return channel, to avoid distortion at the on-air signal. There are hybrids manufacturers that maintain the return control level as they did in the past. This allow operators to adjust "by hunch" this critic level. This makes the voices of the reporters and interviewed people distorted or with coloration.

In Solidyne obviously, we keep a high grade of excellence in the audio quality of the hybrid on-air sound. And that quality do not depend on the

operator settings. Note that the Solidyne Hybrid on-air audio quality of the local journalists is ever perfect and without any coloration.

To achieve this level of quality we use a narrow-band return filter. Then the return signal is limited to the band 400 – 2.200 Hz in order not to distort the signal to the air. This narrow band intelligibility remains high (due to processing) but occasionally may seem to the remote people that it "has little volume" because his band is narrow. This should not worry because it is a subjective sensation that does not affect the intelligibility of speech.

2.6 *Speakerphone*

This mode creates a dialogue between the operator and the lines on HOLD. When activated, interrupts the program signal sent to the lines and enables the microphone on the front panel.

The operator listens to all lines on hold on speakers (or headphones) connected to the output 'speakerphone' on the rear panel.

To enable/disable speakerphone, press the Speakerphone button on the front panel. The screen will show "Speakerphone mode" indicating that this mode is active. The speakerphone mode is automatically disabled when no lines is on hold.

✍ | Lines on hold are not heard together, but they all listen to the operator

2.7 VQR: Voice Quality Restoration

VQR stage is activated by pressing the button **VQR**. The user adjusts the degree of reconstruction using a bass (Low Band) and highs (Hi band). Both controls have a wide range of work, allowing the processing including telephone signals whose bandwidth is severely restricted.

2.7.1 Low band

Manages the level of lows added to the original signal. With the fader closed there is no reconstruction for low frequencies.

The level of reconstruction, or amount of low frequencies that is possible to add to the signal, depends on the audio quality of the telephone line (all communications don't transmit the same bandwidth) and the telephone or microphone used at the other end. Obviously, same results are not obtained using the small microphone of a cellular telephone or a microphone of good quality with a portable console. at least quality has the transmission (smaller bandwidth) smaller will be the action of VQR processing.

Make sure to listen to the processing in the main monitors of the control room, to avoid an excessive reinforcement of lows in the processed signal; that can take place if you are monitoring the communication using small headphones or loudspeakers of bad quality.

2.7.2 Hi band

It controls the level of high frequencies added to the original audio coming from the telephone line. With the fader closed the high processing deactivates.

The action of this control is much more critical that the Low Band, since an excess of highs processing will generate an "artificial" sound; and in extreme case "crashed high" sound can take place, that will be annoying to the listener.

On the other hand, consider that an A.M. radio can require more emphasis in high frequency than a FM; to obtain a well-known improvement on the air; therefore the control Hi Band has an ample rank of action.

The reconstruction level -or amount of highs added to the signal- depends on the quality of the transmission. This stage will be affected, mainly, if the line has much background noise.

2.7.3 Control NOISE

This control is used to reduce the background noise present in the phone line. It acts only during the silences in the conversation, attenuating the level of the signal to suppress the noise. This is quick action gate reason why its effect is imperceptible with normal levels of noise, not affecting the word.

The NOISE fader acts changing the threshold of the expander/gate. When background noise is

under this threshold the expander/gate works attenuating the noise.

Closing the fader the expander/gate is turned off. When opening the fader increases the threshold, that is to say, the signal level below which the expander/gate goes off. The action of the expander/gate is showed in the display by the NOISE CONTROL indicator.

How use this control

Increase the threshold raising the NOISE fader until eliminating the background noise. An insufficient level will do that the noise remains, although reduced. An excessive level will cause that the audio appears "intermittent".

Next some important tips to take in mind when use this control:

- If the background noise in the communication is very high, will be always over the maximum threshold (knob at rigth) with which the noise gate will not work correctly.

- Consider that the expander/gate releases whenever the audio signal is below the threshold. If the background noise is very variable in level (noise from a street, for example), it agrees not to use the NOISE CONTROL to avoid that during the pauses it activates and deactivates generating an intermittent background sound. In these cases it is preferred to leave the ambient noise.

- Also can happen that the background noise is very notorious (a strong humming or buzz) and although the gate can attenuate it during the pauses, the effect "appearance" and "disappearance" of the noise is more annoying than the own noise, due to a psychoacoustic phenomenon according to which the ear "is accustomed" to the floor of constant noise when concentrating the attention in the word.

According to these recommendations, your decides when is convenient the use of the noise gate and when you prefer do not use it.

2.8 Settings

This menu has advanced configuration options. Some are defined only once during the installation of the unit. Other options let you change the working mode of the DH-400.

To access the menu, press and hold down the buttons "Display" and "Next". To navigate the options, press "Next". To change the values use the "Line" buttons, which illuminates according to the option.

DH-400 settings menu has the following options:

2.8.1 Max Hold Time

This sets the maximum time that a line can remain on hold. "Disable" allows to hold a line by indefinitely time. The default setting is 45 minutes.

2.8.2 Auto answer

Define the number of 'rings' that the hybrid waits until answer. Default value: 2 rings.

2.8.3 Receive gain

The gain applied to incoming audio. Default value is 0 dB. **It is recommended do not change this value.**

2.8.4 Acoustic Echo Filter

The acoustic filter cancels the audio of the phone line that re-enters from a speaker into the microphone. This is the case of a communication that is amplified by loudspeakers for announcer heard on the floor (eg: TV).

The options are enabled/disabled (default). Do not enable this option if you don't use open monitor speakers.

2.8.5 Receive gate

Digital noise gate. Disabled by default. It can be enabled, but for the operator is easier use the noise gate knob of the VQR stage.

2.8.6 Message record

DH-400 can manage 3 different messages:

- ✔ Auto-answer
- ✔ Rec-mode
- ✔ Televote

To **select the message** to record, enter the mode "Settings" by pressing <Display + Next>. Press the up/down ("Line1"/"Line2") and watch the video display. The recording control buttons are "Line3" (PLAY) and "Line4" (REC).

You can record the message using the built-in microphone, or from an external source. The unit has an input labeled "Record Message". When this input is connected, audio will be recorded from this input. If the input is unconnected, pressing "REC" is recorded the microphone on the front panel.

To rec, **press and hold the REC button while talking**. The recording ends when you release the REC button, or complete the maximum recording time (10 seconds).

Once recorded, the message can be heard with "PLAY" ("Line3"). The audio is played by the "speakerphone" output.

> ✍ Depending on how is the connection to the console, you can record the message disconnecting the jack from the "Send to phone line (which sends audio from the console to hybrid) and connect it momentarily in" Record Message". This way you can send the message from the console, either playing an audio file or using a microphone from studios.

2.8.7 Line Mode Setup

Each phone line can work in the following ways:

- *STD: Standard operation; to put callings on-the-air.*

- *REC: Recording; to record the incoming calls using a computer.*

- *TVT: Tele-vote; DH400 software keeps track of incoming calls.*

In the first instance, the "Line Mode Setup" displays on the LCD status lines 1 and 2. To change the status, press the button on the line to edit.

To change lines 3 and 4, press "Next". The screen displays the current mode of these lines. To change, press the line button you want to modify.

2.8.8 Max Rec Time

Set the maximum recording time for all lines defined as rec mode.

After this time, the hybrid ends the calling and the line is ready to receive a new calling.

"Max Rec Time" can adopt values between 10 and 120 seconds, in step of ten seconds.

2.8.9 Line Hold Mode

This option should only be changed when the unit is used in "Sports" (see "3.6 -Sports Connection Mode") to allow the lines "on hold" are heard through the exit "Hold cue/ Speakerphone". There are two options:

Normal (default)

This is the normal mode used to send calls to the air and conferencing. 'On hold' lines receives the audio program, including the other lines are on the air.

The audio of lines on hold can be heard on "Hold cue/speakerphone" output by activating the speakerphone.

Cue out

This function is used when the hybrid is used as "Sports" mode (see "3.6 ConnectingSports mode"). The audio of lines on hold is sent to "Hold cue /Speakerphone" output.

The advantage of this configuration mode for "Sports" are:

- The operator always listens to the lines. No need to use speakerphone to hear the audio of the hold lines.

- The lines 'on hold" hear the main program, while the operator listens to that lines in the previous channel (cue).

⚠️ **In "Cue Out" mode, if one line is on-the-air and another line is on hold, the line on hold <u>do not hear</u> to the line on-the-air.**

2.8.10 Install
(Lines Impedance)

This mode is used to adjust the phone lines impedance, allowing the DH400 tolerate different types of phone lines available today (mobile and IP adapters, private small-centrals, conventional land lines).

This adjustment is made only once to install the hybrid. The procedure is explained in the following chapter.

SECTION 3 – Installing

3.1 REAR PANEL
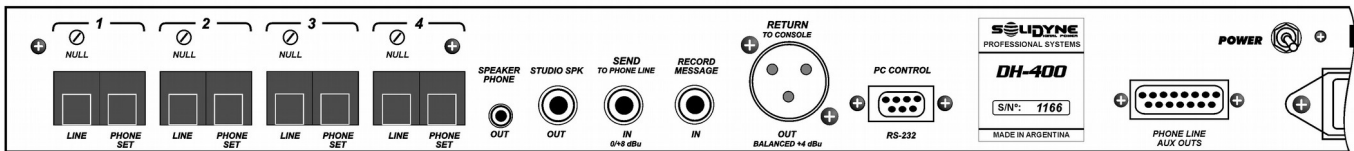
3.1.1 LINE 1/LINE 4

RJ-11 to connect the phone lines and the associated telephones. LINE 4 supports a cell phone connection. The land lines uses the two central wires of RJ-11.

⚡ HL202 and 203-VQ have protection with SIOV varistors against voltage overshoots caused by ligthnings; is recommended to install an external surge suppressor for each phone line.

3.1.1.1 Line impedance

Once the lines are connected, we recommend to adjust the impedance for each line. This adjustment allows to DH-400 an optimums behavior with phone lines of different features (land-lines, cell phones, VoIP adapters, PBX).

This adjustment is made manually for each line, from trims located at rear panel (Null). Proceed as following:

- At frontal panel, press and hold the buttons *"Display"* and *"Next"* by 3 seconds. Now press *"Next"* to explore the options and select *"Install MODE"*. Enable the option "Install" by pressing "Line-1". Display will show "Install ON".

- Save and exit y pressing "Display". The display will show "Install MODE". **In this mode the digital echo cancellation is disabled.**

- Make a phone call using Line-1 and put the on-the-air in the hybrid (if you calls from the telephone connected to the hybrid, the calling is transferred by pressing 'Flash'). It is not necessary that the hybrid is the on-air in the console.

- Press "Display" to view the level meters. Send audio to line and see at the VU the reception level (RCV).

- Using a small screwdriver, carefully turn over **"Null Line 1"** on the rear panel. Confirm that the level displayed in the reception level indicator (RCV) is minimum (typically one or two segments).

- Repeat the operation for each line.

- When the adjustments are completed, access to the Settings menu, go to "Install mode" and disable it by pressing the "Line-2". This enables digital echo cancellation. **It is important not to skip this step.**

3.1.1.2 Wired cell phones

RJ-11 "LINE 4" supports direct connection of a cell phone. The cellular connects to the hybrid using the "free hands" connection of the cellphone.

For make this you need an special RJ-11 cable-adapter, whose connection will depend on the brand and model of your cell phone. You will

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need to purchase the "free hands" accessory correspondent to your cell phone and to check the user manual of the unit to make the connection, according to the following indications:
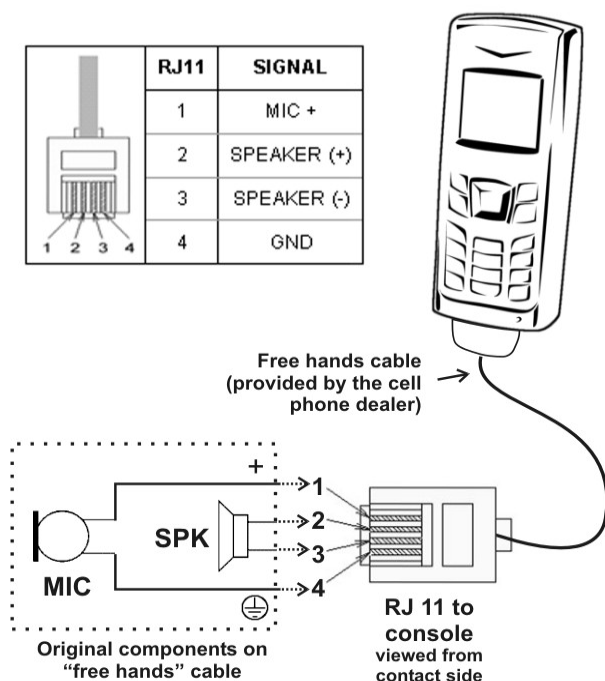

Fig. 2 – Cell phone connected via hands-free connector.

Cell phone connects directly to "LINE 4" RJ11. The hybrid automatically detects the cell phone and changes the input mode from 2-paths to 4-paths.

The cell phone transmits through the "free hands" connector the audio signals: microphone and loudspeaker. DH-400 receives, via cell phone, the remote audio (that is to say, the audio of who is at the other end of the line).

On the other hand, the hybrid sends to the cell phone the audio from the Studios (return signal). Usually the microphone and the loudspeaker at the cell phone are disconnected when the phone operates in "free hands" mode.

3.1.2 SPEAKERPHONE

Line output to connect powered speakers (or headphones) to listen to the **audio from lines on Hold**. All 'HOLD' lines are heard, mixed, through this output.

3.1.3 STUDIO SPK

Output for monitoring loudspeakers. It gives the same signal as "Return to console" to be amplified in the studios. In this condition may be necessary to enable the acoustic cancellation (see "2.8 - Configuration Options").

3.1.4 SEND to telephone line

Input to send audio to the phone lines. The level of listening to the caller (sometimes called "feedback") depends on the level sent to this input. It must be between 0 and +8 dBu in order to the hybrid sent the appropriate level to the telephone line.

3.1.5 Record message

Audio input to record the welcome messages.

When the hybrid is in *speakerphone* mode, the audio present at this input is sent to the phone lines. If "record message" input is not connected, speakerphone sends audio fron built-in microphone.

3.1.6 RETURN to console

Balanced output with XLR connector. Gives the audio of "ON AIR" lines. This output connects to the air audio mixer.

Nominal output level is +8dBu. Can be attenuated from the setting option "Receive gain" (see *"2.8.5 – Receive gain"*).

3.1.7 PC Control

DB-9 RS-232 standard serial port for connection to the PC. If the PC has no serial port, use a USB to RS-232 cable adapter. Make sure you use a cable of good quality.

3.1.8 Phone Line Aux outputs

Female DB-15. Send the audio signal of telephone lines needed for the work modes "Rec" and "Sports".

PIN	SIGNAL / LEVEL	USE
1	Line 1 / 0 dBu	Mode Sports
2	**Line 2 / 0 dBu**	**Mode Sports**
3	Line 3 / 0 dBu	Mode Sports
4	**Line 4 / 0 dBu**	**Mode Sports**
5	CUE of lines on-hold	Mode Sports
6, 7, 8	**No connected**	**-**
9	Line 1 / -20 dBu	Rec mode
10	**Line 2 / -20 dBu**	**Rec Mode**
11, 12, 13	Ground	Rec Mode & sports
14	**Line 3 / -20 dBu**	**Rec Mode**
15	Line 4 / -20 dBu	Rec Mode

3.1.8.1 Recording outputs

The outputs "REC" give signals "ring" and "Caller-ID" of the lines involved in rec mode, for CallerID via software (these signals are not saved in the audio file).

The output level is -20 dBu, for direct connection to conventional audio inputs on the computer.

The recording is performed by the DH-400 application on the master terminal (see *3.5 - Connection for recording*).

3.1.8.2 "Sports" outputs

This outputs sent the signal of the lines that works in *normal mode,* once the hybrid take the line on air. The nominal output level is **0 dBu**, to connection to the on air mixing console.

3.2 Connecting a console using hybrid send/return

If the mixing console have send & return for external hybrid the connection is simple:

- **DH-400 output** *(Output to console) connects to the console input "Return from external hybrid". Remember that "Output to console" is balanced.*

⚠️ To connect this output to a unbalanced input, leave the pin 3 unconnected (connect only: 1=gnd; 2=signal). The levels falls 6 dB when the connection is unbalanced.

- **DH-400 input** *connects to the console output "Send to external hybrid".*

✎ This is a mix-minus output, which means that it is the PGM mix without the hybrid signal (the input "Return from external hybrid" is not mixed). This prevent feedback's. Note that most of mixing consoles are not designed fro broadcasting no mix-minus outputs.

3.3 Connecting hybrid send/return to consoles Solidyne 2300 series

Solidyne consoles 2300 series provide connection to send & return external hybrid, through a 1/4" stereo jack located on the rear panel. The external hybrid also manages from the Master hybrid command, avoiding having to use input channels for connection of the hybrid.

You can ask Solidyne, by purchasing the hybrid, the DH-400 connection cable cable to 2300. Or you can build on the radio. The cable will plug stereo (TRS 1/4"), connected to two cables shielded wire. One cable connects the tip of TRS to a plug mono (TS 1/4") and the other one connects the ring of TRS to a female XLR.

Next chart illustrates the connections:

"External Hybrid" I/O at 2300 consoles (TRS 1/4")	DH-400	
	Send to phone line (plug mono 1/4")	Balanced output (female XLR)
Tip	tip	-
Ring	-	pin 2
GND	sleeve	pin 1 (pin 3 n/c)

Connection for I/O to external hybrid at cosoles Solidyne 2300 (shielded wire; Belden type).

✎ To other models of consoles Solidyne, and consoles from other manufacturers, refer to the manual to see the connections for external hybrid.
If the console has no to send/return connection for external hybrid, the HL-202 must be connected to an line channel, as explained below.

3.4 Connection to consoles without I/O for external hybrid
(recording and live mixers)

In consoles that have no dedicated I/O for external hybrid, the hybrid is connected to a channel (line). The hybrid output (output to console) is balanced XLR connector.

This output must be connected to the console to an input channel balanced line to send the calls to the air (PGM).

Send to phone line is the audio input of the hybrid, that receives audio from the console to send it to the phone line.

This input **is connected to an auxiliary output of the mixing console**, distinct from the main output (aux, rec, FX). The mixer must provide between 0 and +8 dBu.

Never assign the channel that receives the signal from hybrid to the same mix sent to the hybrid (aux, rec, FX, etc.), because it will produce a feedback loop.

⚠ Never use the main output (program output) to send audio to the hybrid. This will cause a feedback loop when the hybrid be on air.

Figure No.7 shows a connection example. DH-400 enters the console on Channel 5 and receives signal via the AUX-1 in the console.

Channel 5 will be assigned only to LR (or PGM, master output), to put the call on the air. AUX-1 can not be opened on channel 5, since it would be sent to the input of the hybrid's own output of the hybrid.

The other channels are sent to the hybrid opening AUX-1 (also going to LR). The mix AUX-1 is what will hear the caller.

3.5 Connection for recordings

The recording mode is activated independently in each line of the hybrid. Be changed from the settings from the front of DH400 or the control software. The software enables recording only in the terminal "master". You can not record on remote terminals.

The outputs for recording (see "Phone line aux outputs 3.1.8") are directly connected to the line inputs of the computer "master" (which is connected to the hybrid).

Below is a connection diagram. In the example uses the integrated sound on the motherboard, and an additional sound card installed on your computer. This will get 4 recording channels (two stereo).
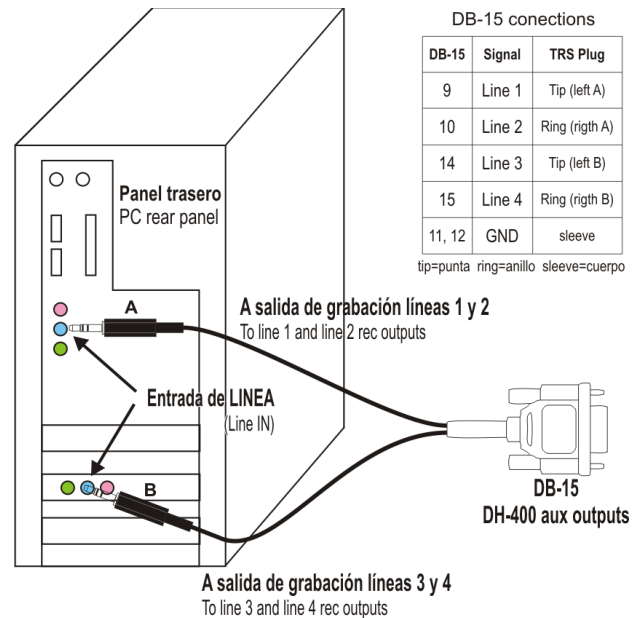
DB-15	Signal	TRS Plug
9	Line 1	Tip (left A)
10	Line 2	Ring (rigth A)
14	Line 3	Tip (left B)
15	Line 4	Ring (rigth B)
11, 12	GND	sleeve

tip=punta ring=anillo sleeve=cuerpo

Fig. 5 – Recording with standard sound cards

For details about recordings, please refers to the on line help of DH-400 software.

3.6 Connections for 'Sports' mode

⚠ **VERY IMPORTANT**
In order to work in this mode, you must change the settings for "Line hold mode" to "Cue output" (see "2.7.9 – Line Hold Mode").

This mode is intended to solve broadcasting of sporting events, in which there is a main story and correspondents may be in other areas, broadcasting from consoles connected to cell phones.

Each phone line is connected to an input channel on the console to handle the signals independently.

DH-400 has a DB-15 connector that sends separate signals from each telephone line. In this way you get a fader for each remote correspondents.

The output level 'sports' is 0 dBu. If connected to the auxiliary input level -10 dBV, adjust the input gain of each channel to work with the faders in the right

area, avoiding unnecessary amplification of noise floor of each line, which would make it audible in the previewing (CUE signal is pre-fader).

Below is a wiring diagram for a console Solidyne 2300. SND and AUD are aux sends of the console.
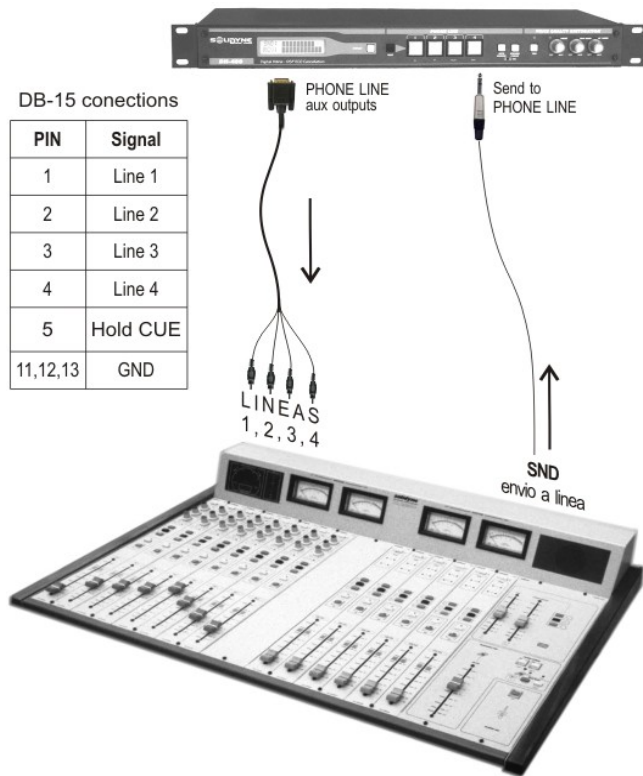

PIN	Signal
1	Line 1
2	Line 2
3	Line 3
4	Line 4
5	Hold CUE
11,12,13	GND

Fig.6 – Connection in mode "sports" using a mixing console Solidyne 2300

The hybrid is operated normally. The main story is on the air while the other lines remain on hold.

To preview the lines on hold, activate "CUE" in the console channels, since the audio of the lines is always present at the output "sports".

3.6.1 Using DH-400 in 'sports mode'

In the control room, the main speaker is On Air both in the DH-400 as in the channel of the console. The other lines are kept in "Hold" in the hybrid and "cue" on the console, but not the On Air.

At the console, the channels connected to the lines are assigned to Program (PGM), but never to Send (SND), since this will cause audio feedback loop.

The console sends the hybrid (SND), audio from the floor announcer (assigned to PGM and SND) is heard by both the relator who is on the air as the reporters (lines On Air and Hold). In some cases, the operator from studios airplay some sound effects to notify the relator that one of the reporters asked to leave the air.

When a reporter tells of an incident, the operator heard in the speaker 'CUE' of the console. To put on the air, toggle it to "AIR" in the hybrid and opens the corresponding fader at the mixing console.

When the line is On Air in DH-400, it goes into conference and is heard by the relator (all On Air lines in DH-400 are in conference).

To quit the line from Air, when the report is complete, close the channel on the console and back the line to Hold at the hybrid.

WARNING: At "Phone line aux output" the audio is always present; when the line is On Air and when is on Hold. Take care for not put on the air a channel from console accidentally.

*To **private talk** with Hold lines use the function **speakerphone** and the bluilt-in microphone (see 2.6 – Speaker phone).*
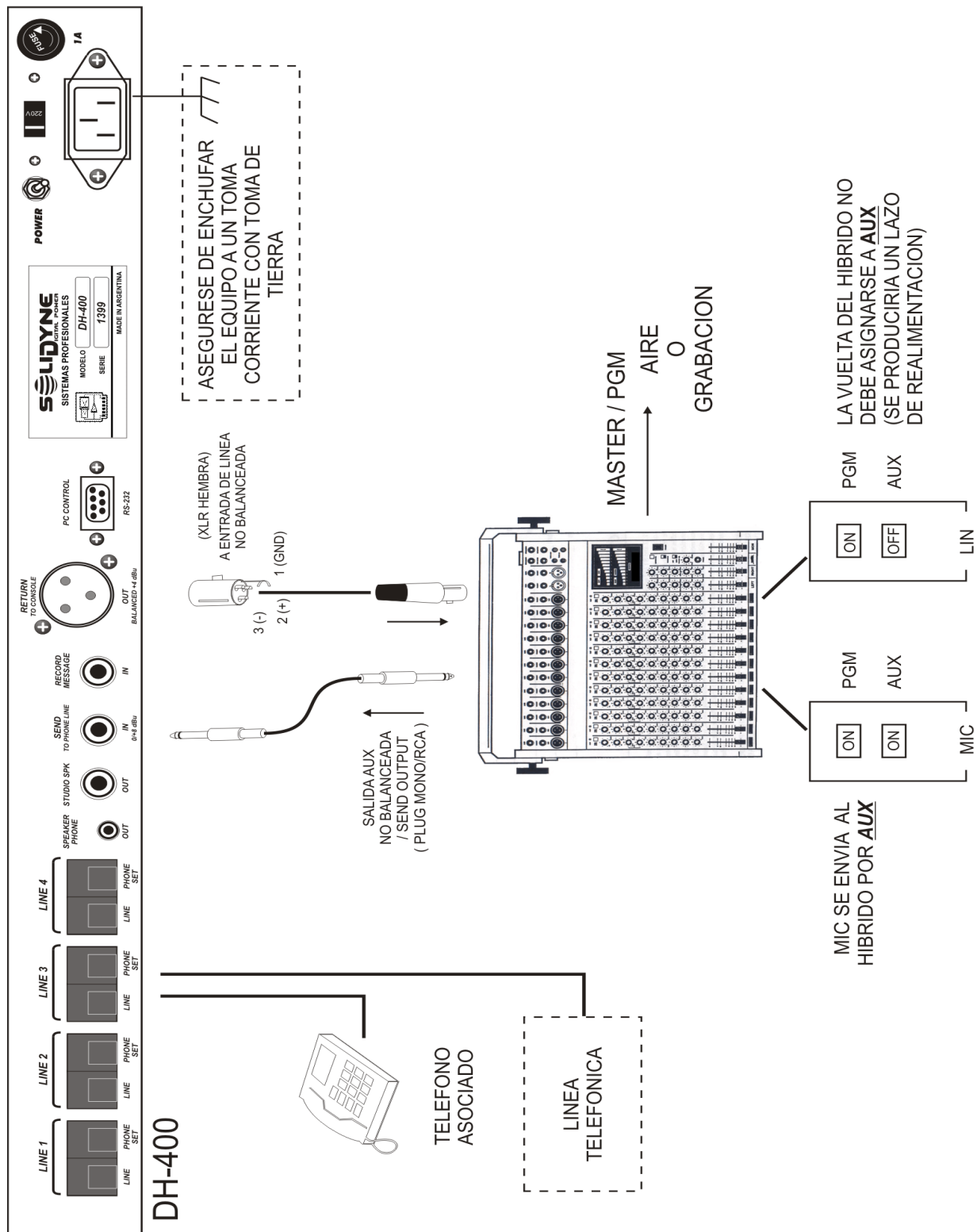
Fig. 7 – Connection to a standard recording mixers

SECTION 4 – **Software**

4.1 Overview

✎ This is a short reference about the software. For details please refers to the on line help. You will find a .pdf document at DH400 shortcut folder .

*   *DH-400 software interface allows to control all operative functions of the hybrid.*

*   *Designed for touch screen.*

*   ***Talk-back** button for each line.*

*   *You can command the hybrid from any terminal of the LAN. DH400 software can run at several terminals at the same time.*

*   *In a terminal, allows to work with up to 4 units simultaneously (16 lines) locales or remotes.*

*   *Each line have a text box to enter information about the calling, displayed at all terminals in real time.*

*   ***Televote:** the software take the count of incoming calls to lines in Televote mode.*

*   ***Recording:** lines settled at this mode are recorded by DH-400, witch generates audio files ready to be aired.*

*   ***Caller ID:** At recording mode, detects the phone number of incoming calls and add it to the file name. This way, the operator known the caller's number.*


4.2 Installing

DH-400 software run on Windows XP - Vista - Seven. You needs administrator permissions in order to install. Insert the CD-ROM in the CD player and follow the instructions.

4.2.1 USB to serial port adapter

If the computer do not have an available serial port, you must use an adapter cable USB-to-serial. These adapters come with their own drivers, to be installed in Windows to emulate

virtual serial port. To install the adapter cable, use the disk supplied by the manufacturer, following the instructions. Once installed, check the COM assigned by Windows.

In this example, the adapter was assigned to the COM3. You must enter this value at the DH-400 software, in the section *configuration port;* as is detailed at next.
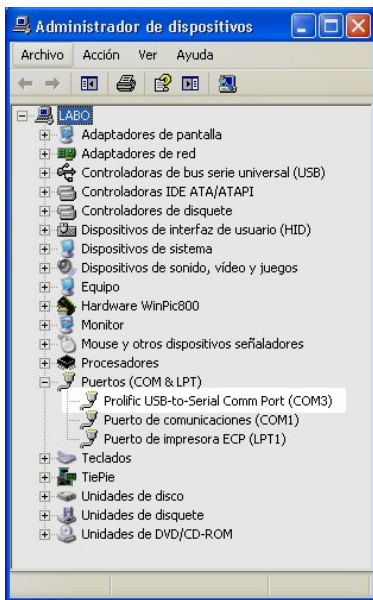
At start up, the software check the serial ports to find the hardware. If there is no hardware connected to the PC; the software look at for DH400 connected to other terminals of the LAN.

DO NOT PRESS THE BUTTON "CONNECT" UNTIL THE SEARCH IS COMPLETED.

If non-local or remote computers found, the program offers the option to run as "demo". Detection of remote DH400 terminals is automatic and transparent for the user. Terminals are detected to share the status of the lines and information related.

- **The hybrid can be managed from any terminal**, but obviously one line must be connected to the hardware. The computer connected to the hybrid must run the DH-400 software, and it be the **master terminal**.

- **Up to 4 hybrids can be connected to one computer**, but you can use more

than 4 units distributed on the LAN.

At start up, the software displays a list of the units DH-400 (hardware) found in the LAN. Here you choose the device that you want to control. To manage more than one DH-400 from a single computer; run multiple instances of the software, that is, while the software is running open a second instance of the application (rerun the program). The listing appears again with the available units. Choosing a unit, will open a new window control to manage the second DH-400, obtaining a total of 8 lines. For details, please see the online Help.

4.2.2 Ports settings

Default port is the COM-1. If the hardware is connected to another port (and there is not others DH-400 running at another terminals), the software runs as "demo mode" and you must set the number of port currently used.

By pressing *"Settings"* at main screen, you access to *Settings Options*. The tab *"Connection"*, an the section *"Local serial port"* allows to enter the serial port number used by the hybrid.
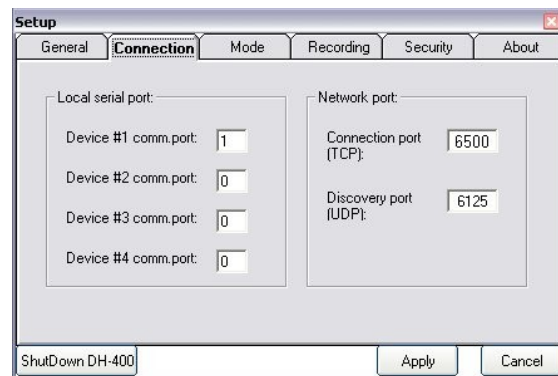
You can connect up to four DH-400 to the same computer, whether real or emulated serial ports. When connecting several hybrids to the same computer, you must manually enter the COM used for each unit. Unused ports must remain as zero. Once you have entered values, click 'Apply'.

> ✎ For more information about settings options, please refers to the on line help.

> ✎ A PC can manage up to 4 DH-400 units (16 líneas), that can be local devices (connected to this computer) or remote devices (connected to another PC of the LAN).

SECTION 5 - **Technical specifications**

Features & Technology	Digital Hybrid with DSP echo cancellation , auto-adjusted levels of transmission and returns by audio limiters and AGC. Acoustic echo cancellation. Auto answering system. Speakerphone hands free for conference rooms and radio auditorium. PC Remote control system. It works over a LAN network. Recording mode with auto-answering and separate outputs for 4 lines. VQR system for restoration of original voice quality.
Phone lines	4 phone lines in conference, with cross gain between them. Cell phones: One phone line can accept a cell phone.
Control by AGC	Output console with a constant level independent of the telephone line, by audio limiter and Digital AGC. 20 dB variation on the phone line produce less than 1.5 dB at the output to console
Input Level	Audio send to remote caller has audio limiter and band pass filtering to operate with input signals between –5 dBu and +8 dBu
Echo Canceler	Typical 45 - 60 dB of echo cancelation, using four DSP devices.
DSP parameters	DSP echo cancelation parameters are factory loaded for quick use of DH400. But all parameters can be modified by the user, using LCD display
Sending level to phone line	-0 dBm +/- 1 dB, measured with 2 km artificial line
Send Filters	Band-Pass filters in send channel, limits response to 400 – 2.200 Hz for canceling on-air sound coloration.
Output Level	+4 dBu balanced. Measured Over 600 ohms or high-Z Studio Speaker: 0 dBm Cue Output/Speakerphone: -10 dBm
Frequency response	200 - 3750 Hz +/- 3 dB without VQR Using VQR it restores audio spectrum between 50 - 12,000 Hz
AIN	Auto-adjustable from 0 to 25 dB, depending on line level
Harmonic Distortion	Less than 0.1% @ 1 kHz, at balanced output
Noise	S/N over 70 dBA, measured with artificial line 2 km More than 75 dBA using VQR
Hybrid rejection	Over 60 dB. Measured with artificial line 2 km
Line Isolation	balanced and floating line inputs with the processor. Isolation 250 V AC
Overload Safety	2 KVolt protection against lightning discharge using SIOV technology
Power	220 / 115 V, 50/60 Hz with a switch. Consumption: less than 20 VA
Dimensions	Rack mount 19", One module high (44,4 mm)