MAINTENANCE AND OPERATION
INSTRUCTION MANUAL

SmartGen 4

RDS / RBDS Encoder
with USB & RS-232 Connectivity

R·D·S
RADIO DATA SYSTEM

UECP Compatible

DB DEVA®
BROADCAST

Contents

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Introduction

Deva Broadcast Ltd. was established in 1997 as a broadcasting and telecommunications equipment importer for Bulgaria and Eastern Europe regions. Subsequently, Deva Broadcast Ltd. has developed and produced a wide range of low and mid power transmitters, RDS/RBDS Encoders and Decoders, Modulation Monitors, Remote Controls, Site monitoring and other systems for many companies. Our high degree engineers accomplish their bright ideas through successful engineering, marketing and management in Deva Broadcast's Headquarter in Bulgaria.

During the last ten years the company products have become our partners' best sellers. After detailed marketing analysis, our team has decided to launch its own brand products based on the latest technologies in the broadcasting business. The company's main goal is to design, develop and offer a complete line of high quality and competitive products for FM and Digital Radio, Radio Networks, Telecommunication Operators and regulation authorities. We base our market authority position on our good after sales support and relation with the clients.

Since 2003 Deva Broadcast Ltd has been ISO 9001:2000 certified by SGS quality certification bureau.

The contractors of Deva Broadcast Ltd. are satisfied with the permanent business comfort and to their own confession they owe it to a great extent as well as their prosperity to the loyal partnership of our company.

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General Information

The SmartGen 4 is a full-function RadioData encoder that conforms to European and US standards for FM datacasting. It supports all service IDs and offers simultaneous scrolling-PS and RadioText messaging.

2-way addressability includes a front-panel USB port for fast and easy static register programming of station and format IDs, and for entering default scrolling or static text. In full-dynamic operation, station automation communicates with direct RS-232 serial connection.

Screen-entry Windows® software makes programming the SmartGen 4 simple and foolproof. The SmartGen 4 can "parse" scrolling text, automatically breaking phrases into word groups, or can display text with the "Safe-Scrolling" option.

Product Features

- Full-function dynamic encoder connects to station automation
- Transmit song titles, etc. in either 'block' or 'safe scrolling' modes
- Includes the TA function for traffic message priority override
- Operates with any FM exciter and stereo generator. A dedicated 19kHz sync source is not required, and a failsafe relay bypass is built in.
- Connects directly to all popular radio automation systems to scroll song titles and advertising.
- Direct-entry programming software runs under Windows® with RS-232 serial and local USB connectivity.
- Integrates easily with specialized third-party software for increased functionality.
- Loop-through or 'sidechain' operation with any exciter/stereo generator combination.
- Simple to install and easy to use!

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TECHNICAL SPECIFICATIONS

Standards Supported	European CENELEC and United States NRSC.
RDS Applications Supported	PI, PS, PTY, TP, TA, RT, AF, DI, M/S, FFG. (A detailed explanation of these applications can be found in section "RDS Applications Supported" on page 14)
Operating Modes	**(1)** Loop-Through: In loop-through operation, the RDS subcarrier is internally mixed with the MPX input and the combined signal is delivered to the RDS OR MPX OUTPUT. The encoder has unity gain in the loop-through mode and accepts a maximum level of 6 volts peak-to-peak corresponding to ±75kHz carrier deviation. Loop-through includes a failsafe Bypass function so that program audio will not be lost if the encoder loses power. **(2)** Sidechain: In sidechain operation, only the RDS subcarrier appears at the RDS OR MPX OUTPUT. This signal is then combined with the FM multiplex baseband in the stereo generator or FM exciter. The monitored MPX (or TTL sync) applied t the PILOT OR MPX INPUT connector is used solely to synchronize the 57kHz RDS subcarrier with the 19kHz stereo pilot. **NOTE:** The SmartGen 4 is shipped from the factory in the Sidechain mode.
Pilot or MPX Input	An unbalanced, bridging BNC input that accepts either the composite/ multiplex (MPX) signal or 19kHz TTL-level pilot sync from the stereo generator.
RDS or MPX Output	An unbalanced, low-impedance BNC output to feed a wideband input of the FM exciter.
RDS Injection Level	Continuously adjustable between zero and 2 volts peak-to-peak.
USB Port	Front-panel USB connector for quick computer programming of static data.
Serial Data Port	RS-232 port (DB-9) for static programming and dynamic messaging. 2400, 4800, 9600, 19200, 39400, 57600 or 115200 baud; 8, N, 1, plain-text ASCII protocol.
TA Switching	The temporary TA flag is set either by a software command or with a momentary contact closure through a rear-panel connector.
Power Requirements	105–130VAC or 210–255VAC, 50/60Hz; 10W.
Size and Shipping Weight	1¾"H x 19"W x 6"D (1U), 44 x 485 x 178mm; 7 lbs., 3kg

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BLOCK DIAGRAM

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FRONT PANEL

POWER ON - This green LED glows whenever primary power is present. If this indicator is off, the encoder will have switched into the failsafe Bypass mode. In loop-through operation of the encoder, Bypass connects the PILOT OR MPX INPUT directly to the RDS OR MPX OUTPUT.

PILOT LOCK - This LED lights when the encoder has locked to the 19kHz stereo pilot signal from the stereo generator, either in the sidechain or the loop-through mode of encoder operation.

FREE RUN - When no 19kHz pilot is present at the PILOT OR MPX INPUT, the encoder defaults to a crystal-controlled internal timebase. This enables RDS transmissions with monaural programming. The FREE RUN LED shows that the encoder has defaulted to its internal timebase.

RDS DATA - This LED flashes dimly as RDS data is being transmitted, serving as an indication that the encoder is operating normally. Even when no dynamic data is being sent, the various RDS groups of static identifiers are updated continually.

TA FLAG - This LED flashes whenever the TA flag is raised, either with a software command or with a switch closure. **REMEMBER:** the TA flag is only temporary. It must be turned off as soon as the announcement ends.

ACTIVE PORT indicators show which communications port is currently in use. The lighted indicator will flash perceptibly as data is passed to and from the encoder.

COM - The COM indicator is the default encoder port and lights when a USB connection is not active.

USB - This LED lights when the USB port is addressed.

FUSE / DISCONNECT - The front-panel fuseholder also provides a means of disconnecting AC mains power in an emergency. Push the fuseholder cap down and pull it away from the panel to interrupt power.

INJECTION LEVEL ADJUST - RDS injection level (subcarrier modulation) is set with this multiturn trim control. A detailed procedure for setting injection level can be found in section "Subcarrier Injection Level" on page 27.

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REAR PANEL

LOCAL
TA CONTROL

RS-232
COM PORT

PILOT OR
MPX INPUT

RDS OR MPX
OUTPUT

AC 115V / 230V

CE

MADE IN BULGARIA

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RDS: Europe vs America

The European Broadcasting Union (EBU) and its member countries originated the concept of "Radio Data" transmission. The European RDS specification, CENELEC Standard EN50067, was first published in 1984. It was revised in 1986, 1990, 1991 and 1992.

European RDS has grown in use following initial adoption of the Standard. RDS is nearly universal throughout Europe; it is almost impossible to find a European FM broadcasting station that does not carry a radio data subcarrier.

The popularity of RDS in Europe is very much in contrast with initial reluctance on the part of US broadcasters to embrace this technology. This can be ascribed to material differences in broadcasting practices.

Almost without exception, FM broadcasting in the United States is 'detached' and independent; that is, each station originates its own programming. One exception might be America's National Public Radio, though for most of the broadcast day even NPR stations originate, or at least schedule, their own programs.

Much of European broadcasting is similar to the concept of network radio that was common in the US prior to the 1950s. In Europe, a central program originator may have many transmitting facilities of modest power situated throughout the country, at several different frequencies to blanket a designated service area. The European disposition toward lower-power transmitters can be found on the "local radio" level as well.

The European concept of a service area equates to the US broadcaster's market. The subtle difference between these designations further characterizes broadcasting practices and ethics. RDS benefits the European broadcaster through almost an altruistic endeavor to be of service to his listeners. The US broadcaster is marketing his programming, and is primarily interested in how he can create additional revenue from RDS.

The RDS System

RDS is a digital data channel transmitted as a low-level subcarrier above the range of the composite stereo program signal in the FM baseband. The data transmission (baud) rate is comparatively low, yet it is quite robust because of data redundancy and effective error correction.

It is not within the scope of this Manual to cover the details of RDS subcarrier coding and modulation. For this the reader is directed to the Specification appropriate to his location, either the CENELEC EN50067 Specification for Europe, or the United States NRSC Specification. It is assumed that the user has some familiarity with the concept of RDS, since the balance of this Manual will deal with specific implication of RDS implemented with the SmartGen 4.

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Addressing The SmartGen 4

Many applications, such as Radio Paging, navigational assistance, roadside message billboards, song titles, stock market updates, etc. all require continuous, on-line access to the RDS encoder by one or more service providers. Some of these applications may promise additional revenue to the station. The SmartGen 4 offers these capabilities and may be addressed by simple ASCII commands, either from station automation or directly by a connected computer.

Particularly in Europe, RDS encoders may be linked with one another for network support applications. The UECP, or Universal Encoder Communication Protocol was developed by CENELEC to support this form of operation, but over the years has seen decreased usage in favor of TCP/IP addressability or direct connection with station automation. The SmartGen 4 fully supports the UECP.

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RDS Applications Supported

The following is an alphabetical listing of RDS applications that are fully supported by the SmartGen 4. The standardized RDS application abbreviation is followed by an expansion of the application name and a short explanation of the function.

AF

List of Alternative Frequencies: A network broadcaster, or one with low-power rebroadcast transmitters (translators) to fill holes in his coverage area, can include a list of all frequencies where the identical program can be heard simultaneously. The RDS receiver (particularly the upscale car radio) constantly searches for the best signal that carries the very same program. When a better signal is found, the radio re-tunes with no noticeable interruption. The principal utility of this RDS function is with European radio networks and US stations with 'translators.'

DI

Decoder Information: This is one of several 'flags' that convey yes/no or other very basic data. This particular flag tells the receiver whether the broadcast is monaural, or is being transmitted in any of several methods of stereo or binaural broadcasting. As many as 16 encoding options may be accommodated! This is a rather esoteric function and, thus far, remains unused both in Europe and in the US.

FFG

Free Format Groups: A provision has been included in the SmartGen 4 to transmit proprietary data directly within a legitimate RDS group. This is a special use of the encoder for non-standard applications. Additional notes can be found on section "Scrolling Display And Dynamic Encoder Operation" on page 61.

M/S

Music / Speech Switch: This flag simply indicates whether music or speech is the primary broadcast programming. The purpose of this function is not well explained in the respective Standards; hence it comes as no surprise that it is not widely used.

PI

Program Identification: This block of data identifies the broadcast station with a hexadecimal numerical code, which becomes the "digital signature" of the station. The code is assigned by the broadcasting authority in most countries, but in the US it is calculated from a numerical encoding of station call letters. The receiver processes the PI code to assist automatic tuning features (station memories), and to prevent false switching to alternative frequencies that might be shared by broadcasters in nearby regions.

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PS

Program Service Name: This is the station's "street name" that will appear on the receiver faceplate display. The PS can be up to eight characters in length (including spaces) and can be as simple as the station's call letters: KWOW or KWOW FM, or a slogan: NEWSTALK or LIVE 95. The Program Service Name is automatically displayed, even on automobile receivers, and because of driving safety considerations broadcasters are generally discouraged from scrolling messages in this field. As a matter of fact, it is a violation of both the CENELEC and the NRSC standards to scroll the PS display, although the practice has become universally common.

PTY

Program Type: The PTY data flag identifies the station format from a collection of pre-defined categories. Many RDS receivers are able to seek the listener's preferred format automatically. This means that a car radio can switch from a fading station to a stronger one that carries the same variety of music, though not the very same program, as provided by AF switching. The PTY function of RDS helps a broadcaster catch 'transient audience' share. A listing of the PTY categories is given on section "Static Data Programming" on page 54.

Under some programming circumstances, the PTY identifier may be made 'dynamic,' changing between categories for a station that "dayparts" (changes its format for specific time periods). The PTY code is not meant to change from song to song or to accommodate a top-of-the-hour newscast, however.

RT

RadioText: This is a 64-character block of plain text that the listener can select for visual display on the faceplate of the radio by pressing an INFO button on the receiver. This function is not available on many automobile radios for safety reasons, which has precipitated the frowned-upon practice of scrolling the PS field instead.

Most radios have limited alphanumeric display capability, so the 64 characters of RadioText march across the front panel, much akin those annoying LED advertising signs found in airport buses or fast food emporia. Like the scrolling-PS implementation, RadioText can announce song titles and performers, run special promotions or contests, or broadcast sponsors' messages.

TA

Traffic Announcement: This is a temporary flag added to the RDS data stream only as a traffic bulletin is being aired. Some RDS car radios can be set to search for traffic bulletins among various TP stations (see TP below) while tuned to a listener's preferred program, or even while playing a tape or CD. As soon as any TP station broadcasts a traffic bulletin, the receiver temporarily switches-over to receive it. When the bulletin is finished, the receiver switches back to the original program, tape or CD.

TP

Traffic Program Identification: The TP flag identifies the station as one that routinely broadcasts traffic bulletins for motorists as part of its normal, everyday programming. When the TP flag is displayed on the receiver faceplate, the radio is searching for traffic announcements. The radio keeps track of TP stations offering this service to speed up the search-and-switch process.

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Before you start

SAFETY WARNING

After removing any housing parts and electronic assemblies it is possible to get access to live parts. It is essential to ensure that the subsequent safety rules are strictly observed:

- Servicing of electronic equipment must be performed by qualified personnel only.
- Before removing covers the equipment has to be switched off and the mains cable unplugged.
- When the equipment is open the power supply capacitors have to be discharged by the help of a suitable resistor.
- During servicing unprotected and operating equipment:
    - never touch bare wires or circuitry.
    - use insulated tools only.
    - never touch metal semiconductor cases because they may carry high voltages.
- For removing and installing electronic components, please follow the recommendations concerning the handling of MOS components.

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OPERATING RECOMMENDATIONS

For the normal and reliable operation of the SmartGen 4 device and reaching better performance we recommend to follow the next list of instructions:

- Please, install the unit only in places with good air conditioning. The unit has been designed for operation within an ambient temperature range extending from 10 to 50°C. But because adjacent, less efficient equipment may radiate substantial second-hand heat, be sure that the equipment rack is adequately ventilated to keep its internal temperature below the specified maximum ambient. When installing, leave a clearance of at least 1 cm around the equipment to allow air to pass freely.
- We do not recommend installation in rooms with high humidity, dusty places or other aggressive conditions.
- Although it is expected that a SmartGen 4 will be installed close to exciters (or transmitters of even higher-power!), please practice reasonable care and common sense in locating the unit away from abnormally high RF fields.
- Please, use only already checked power supply cables and sources. The shielded cables usage is strongly recommended.
- We strongly recommend connecting the device only to reliable power supply sources. In case of unstable power supply, please use UPS (Uninterruptible Power Supply).
- Please, use the device only with placed top cover to avoid any electromagnetic anomalies which may cause problems of the normal functionality of the unit.

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Unpacking and Inspection

IT IS VERY IMPORTANT that the Warranty Registration Card found at the front of this Manual be completed and returned. Not only does this assure coverage of the equipment under terms of the Warranty and provide a means of tracing lost or stolen gear, but the user will be sent specific SERVICE OR MODIFICATION INSTRUCTIONS issued by Deva Broadcast.

As soon as the equipment is received, inspect carefully for any shipping damage. If damage is suspected, notify the carrier at once, and then contact Deva Broadcast.

We recommend that you retain the original shipping carton and packing materials, just in case return or reshipment becomes necessary. In the event of return for Warranty repair, shipping damage sustained as a result of improper packing for return *may invalidate the Warranty*!

Mounting

RACK REQUIREMENT

The SmartGen 4 mounts in a standard 19-inch equipment rack and requires only 1¾ inches (1U) of vertical rack space. The use of plastic washers is recommended to protect the painted finish around the mounting holes.

HEAT DISSIPATION

Consuming less power than the light in a refrigerator, the SmartGen 4 itself generates negligible heat. The unit is specified for operation within an ambient temperature range extending from freezing to 120°F/50°C. But because adjacent, less efficient equipment may radiate substantial heat, be sure that the equipment rack is adequately ventilated to keep its internal temperature below the specified maximum ambient.

AC (MAINS) Power

FUSEHOLDER

The fuseholder is at the far left of the front panel. Apply downward pressure and pull the cap outward to access the 5mm mains fuse. Note that the cap has space for a spare fuse as well. The cap is reseated by reversing the removal process. This fuse also serves as a front-panel emergency power disconnect for the SmartGen 4 in lieu of a front-panel power switch.

MAINS VOLTAGE SELECTOR

Unless specifically ordered for export shipment, the SmartGen 4 is set at the factory for operation from 115V, 50/60Hz AC mains. This can be confirmed by checking the designation next to the mains connector on the rear panel. The *inappropriate* voltage and fuse value will have been crossed out at the factory with an indelible felt marker. To change the mains voltage, first remove

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the top cover of the unit. A clearly marked slide switch is next to the AC mains connector on the encoder circuit board. *With power disconnected*, use a small screwdriver to set the switch for 115VAC or 230VAC operation. Be sure to install the appropriate fuse listed on the rear panel. You can remove the factory strikethrough with (a probably carcinogenic!) solvent, and then cross out the inappropriate marking with an indelible felt pen.

POWER CORD

The detachable IEC-type power cord supplied with the encoder is fitted with a North-American-standard male plug. The individual cord conductors may be color-coded in either of two ways:

1) In accordance with US standards:
BLACK = AC "HOT"
WHITE = AC NEUTRAL
GREEN = EARTH GROUND

2) To European CEE standards:
BROWN = AC "HOT"
BLUE = AC NEUTRAL
GREEN/YELLOW = EARTH GROUND

GROUND LOOPS

Because the unbalanced PILOT OR MPX INPUT and the RDS OR MPX OUTPUT of the SmartGen 4 are chassis-ground-referenced, a mains frequency or RF ground loop could be formed between the input or output cable shield grounds and the AC power cord ground. A 'ground-lifting' AC adapter may well remedy such a situation, although the chassis somehow must be returned to earth ground for safety. Generally, being screwed-down in the equipment rack will satisfy the safety requirement.

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Selection of Operating Modes

SIDECHAIN MODE

Configured for sidechain operation, the rear-panel PILOT OR MPX INPUT connector simply bridges (monitors) the output of the stereo generator to derive timing information from the 19kHz stereo pilot. Alternatively, a TTL-level 19kHz sync squarewave may be applied to this input. We do not recommend this, however, as the phase relationship between the synchronizing squarewave and the 19kHz pilot component in the composite, multiplex output of the stereo generator may not be assured.

In sidechain operation the RDS OR MPX OUTPUT will contain only the RDS subcarrier, the composite/MPX signal is *not* routed through the SmartGen 4. This operating mode best preserves multiplex signal integrity and assures uninterrupted program transmission in the event of a catastrophic encoder failure (very doubtful). As delivered, the SmartGen 4 is configured for sidechain operation.

Referring to the jumper installation drawing, Figure below, locate the 3-terminal jumper strip, located about an inch (2.54 cm) to the rear of the two BNC connectors on the SmartGen 4 circuit board. The shorting clip is positioned "down" for sidechain operation, as shown in the example of Figure below.

LOOP-THROUGH MODE

When the SmartGen 4 is jumpered for loop-through operation, the RDS subcarrier is internally combined with the composite/MPX signal. This means that the RDS OR MPX OUTPUT *will include* the composite/MPX program signal (at unity gain) with the RDS subcarrier added. Also, in the loop-through mode the internal bypass relay will pass-through the multiplex signal in the event of an encoder power failure. The lower illustration in Figure below, shows the "up" position of the shorting clip for loop-through operation.

Encoder Mode Jumpering

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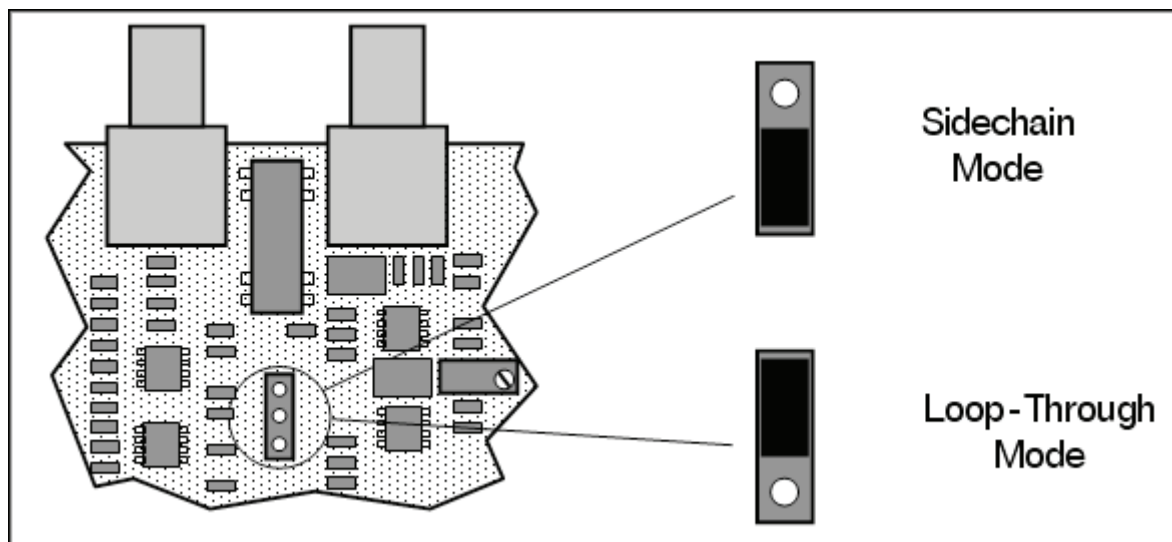
Connecting The SmartGen 4

IMPORTANT CONNECTION CONSIDERATIONS!

The SmartGen 4 encoder must be properly configured for the desired operating mode: sidechain or loop-through before it is installed in the signal path. See the preceding instructions to confirm that the encoder circuit board is properly jumpered before connecting the SmartGen 4 to other air-chain equipment.

Also, it is important that the operating software be installed on the PC before it is connected to the encoder for programming the 'static' message registers and operating defaults. In addition, we heartily recommend testing the encoder with its controlling interface (computer, terminal, automation, etc.) before it is placed in the air chain. This will ensure that 2-way communication with the encoder can be established and that the encoder is properly initialized.

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SIDECHAIN MODE (PREFERRED)

Attach a BNC 'T' adapter to the composite/MPX output of the stereo generator as shown in Figure below. Connect one side of the 'T' directly to a wideband (composite/ MPX) input of the FM exciter and the other side to the PILOT OR MPX INPUT of the SmartGen 4. (This is only a bridging 'sync' connection when the circuit board has been jumpered for sidechain operation and does not affect the composite/MPX signal.)

If the stereo generator has a dedicated 19kHz TTL-level output designated for RDS encoder sync, you may connect this to the encoder PILOT OR MPX INPUT. We do not recommend this, as a dedicated 19kHz sync output may not have the proper phase relationship with the stereo pilot.

Cable the RDS OR MPX OUTPUT of the encoder to a second wideband (subcarrier) input of the FM exciter.
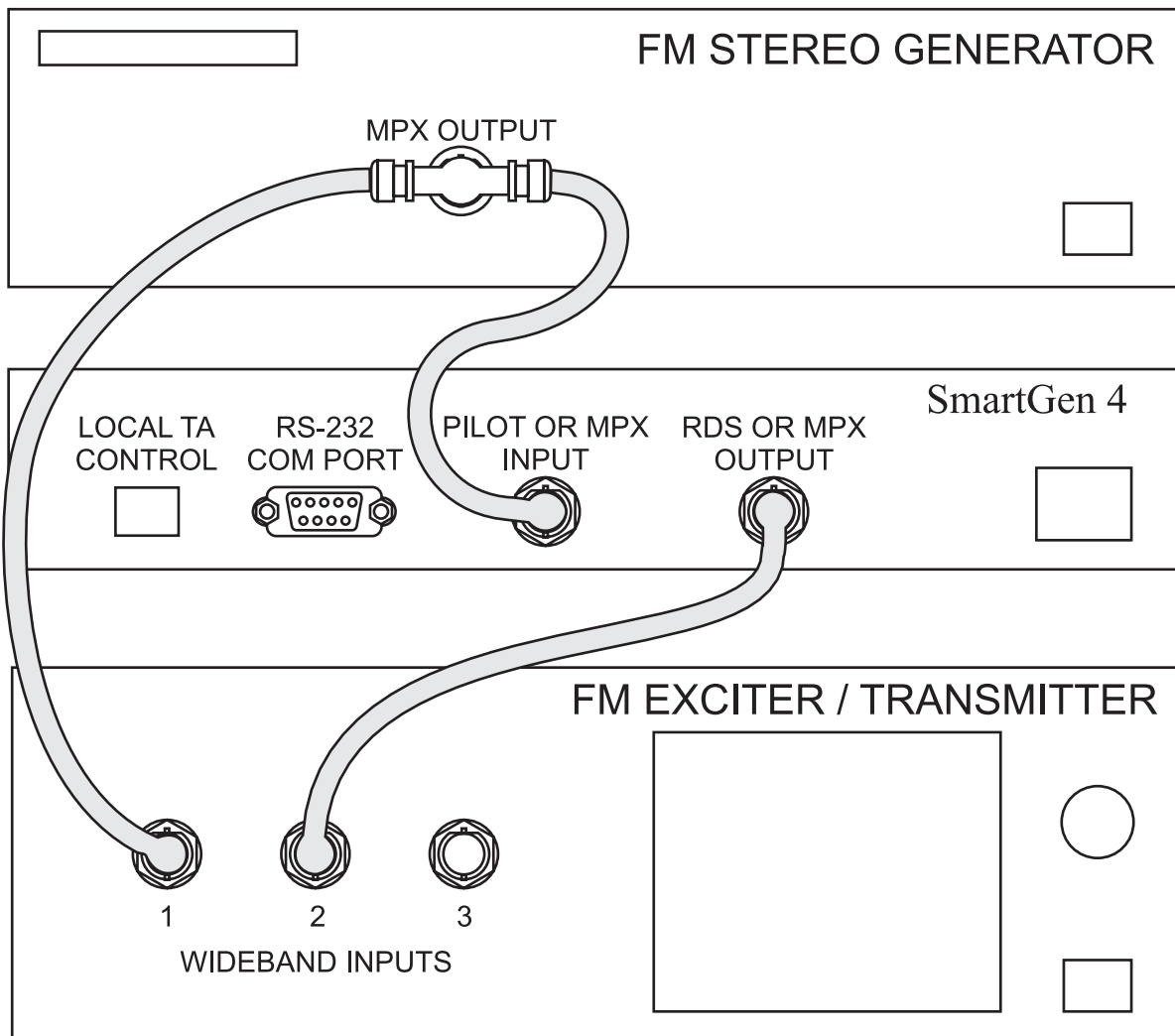
"Sidechain" Encoder Connection

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LOOP-THROUGH MODE

In the loop-through mode, the output of the stereo generator is cabled directly to the PILOT OR MPX INPUT of the SmartGen 4 as shown in Figure below. Connect the RDS OR MPX OUTPUT of the encoder to a composite/MPX wideband input of the FM exciter. When internally jumpered for loop-through operation, the composite/MPX signal *passes through* the encoder with unity gain, and with the RDS subcarrier added.
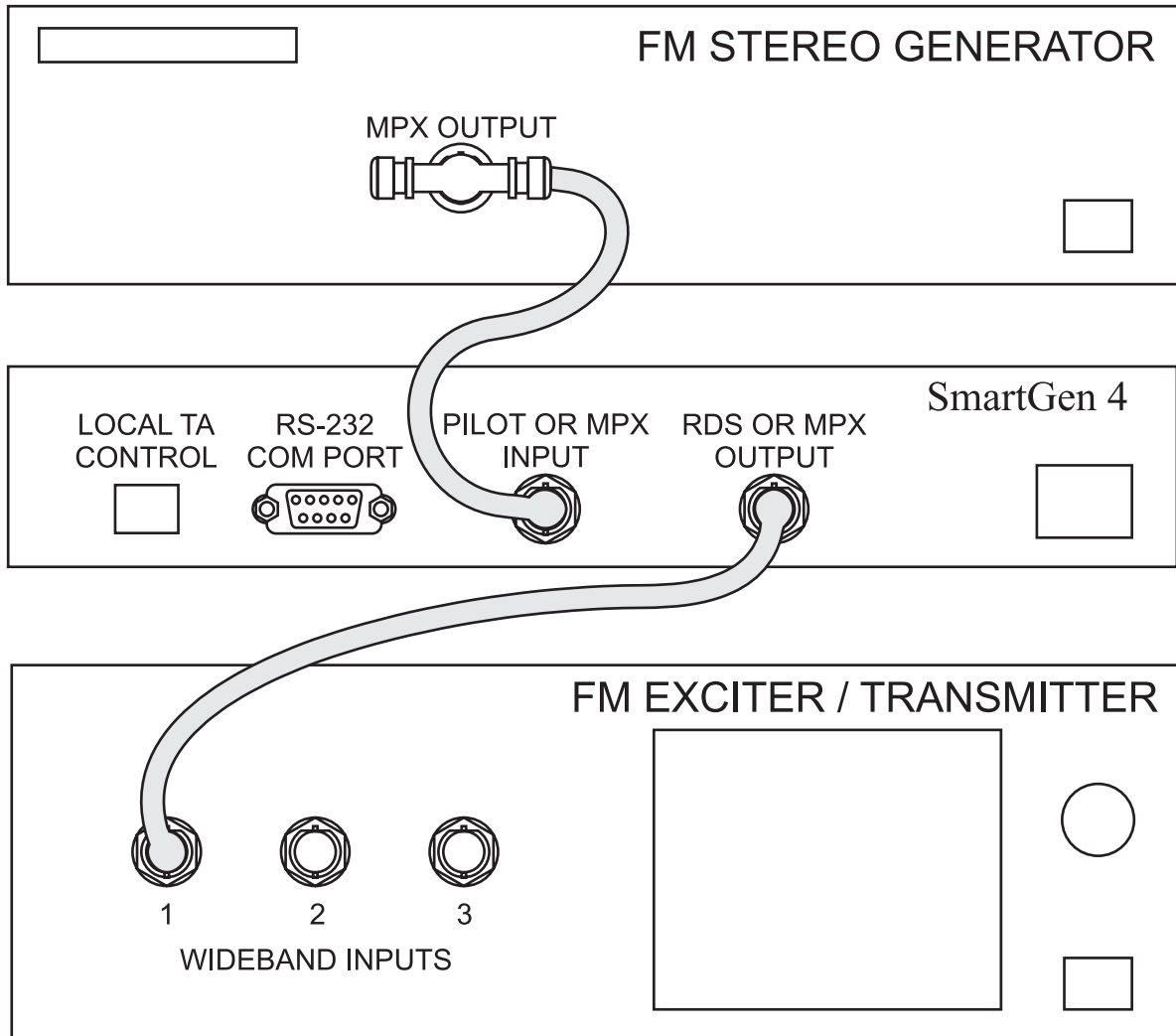
Loop-Through Encoder Connection

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MANUALLY ACTIVATING THE TA FLAG

The Travel Announcement feature is a temporary command. This flag must coincide with the actual voice warning of a traffic condition. The encoder includes a provision to access this flag with a manual switch closure, which will doubtless prove faster, more convenient and more reliable than software control of the TA function.

A run of twisted-pair cable may be taken from the LOCAL TA CONTROL barrier strip connector on the rear panel of the encoder to a normally open momentary (spring-return!) pushbutton switch located conveniently at the announcer's operating position.

The TA flag will be transmitted as long as the switch is held down. *It is important that this alert is active only for the duration of a traffic announcement*. The TA flag must be turned off immediately after completing the verbal traffic warning.

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Data Interconnection

THE SMARTGEN 4 MAY BE ADDRESSED TWO WAYS:

1) a front-panel USB port, convenient for setting service flags and entering static RDS data;

2) a rear-panel RS-232 COM PORT, which may be connected directly to station automation equipment for dynamic messaging… song titles, weather info, etc.

NOTE: For USB or RS-232 serial interface with a PC for local programming of the 'static' data registers, software must be installed on the computer *before* it is connected to the encoder. Refer to software installation instructions beginning in section "Programming Options" on page 29.

For direct connection to station automation, the rear-panel RS-232 COM PORT DB-9 connector is addressed in simple ASCII text. Communication syntax is explained with advanced programming instructions in section "Advanced Programming for Station Automation" on page 29.

COMPUTER OR TERMINAL REQUIREMENTS

For fast and easy encoder programming via the serial COM port, Windows®-based RDS Data-Entry Software routines have been supplied on a CD-ROM. This software also may be downloaded from the Deva Broadcast Website. Alternatively, the encoder may be addressed with any computer running a 'terminal emulation' program (e.g.: HyperTerminal, normally supplied with Microsoft Windows®), or with a simple "dumb" terminal that has an RS-232 interface. The encoder can accommodate several baud rates, but the factory default is 9600 baud. Set the terminal (or terminal program) for: 9600-baud / 8 data bits / no parity / one stop bit (9600,8,N,1).

Static PS and other IDs, flags, the alternative frequency list and operating mode options are uploaded into non-volatile encoder memory from a PC, either with USB, RS-232 serial or TCP/IP connections. If scrolling-PS or dynamic RadioText messaging is not used, a slogan, phone number or advertising messages can also be entered manually into the 64-character Dynamic PS and RadioText fields. These will be displayed on the radio faceplate as a repetitive scrolling-PS or static RadioText messages. Keep in mind that Dynamic Radio Text and scrolling-PS are separate functions, both of which are simultaneously available with the SmartGen 4.

Once static data has been uploaded, the encoder may be disconnected from the computer, relocated to another operating point, or reconnected to an alternative data source for dynamic messaging. This may be a hard-disk-based station automation system that provides song title and artist, plus ads or station promos. The automation system must be configured to the encoder's baud rate and programmed to deliver dynamic data in proper syntax as explained by the advanced instructions in section "Advanced Programming for Station Automation" on page 29.

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MODEM LINK

In addition to the LAN connection, a modem link also may be used for addressing the encoder from a remote location via RS-232 serial connection. When properly configured, a modem link will appear 'transparent,' as if the encoder were connected directly to the controlling system. Figure below, shows proper pin connections for the cable used to connect the SmartGen 4 to a conventional external modem. The three conductors shown are the only ones required.
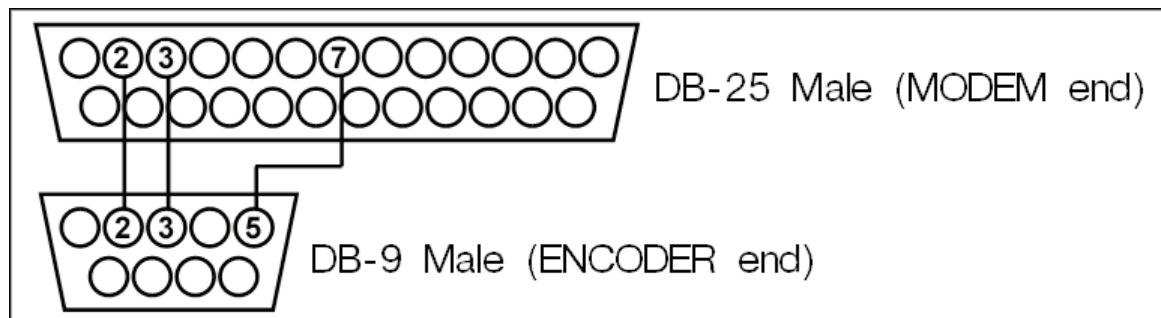
Encoder/Modem Connections

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Subcarrier Injection Level

The front-panel INJECTION LEVEL ADJUST potentiometer sets the level of the RDS subcarrier. This is a 15-turn potentiometer to give the required adjustment resolution.

In the *sidechain* mode of operation, the RDS subcarrier is the only signal that appears at the rear-panel RDS OR MPX OUTPUT connector. Because some exciters require a high signal level at auxiliary wideband (SCA) inputs, the RDS signal has been made adjustable to any value between zero and 2 volts, peak-to-peak.

In *loop-through* operation of the encoder, the composite/MPX program signal that is fed to the PILOT OR MPX INPUT appears with unity gain at the RDS OR MPX OUTPUT. A typical peak-to-peak level of the Composite/MPX program signal is 3 volts. The same 0-2V RDS subcarrier level range is available in this mode, so obviously the INJECTION LEVEL ADJUST control will be closer to the counterclockwise end of its travel to give a level of 0.1 volts p-p, which would correspond to the typical 3% to 4% RDS injection.

SETTING SUBCARRIER AMPLITUDE

Injection level is best set with a modulation monitor that includes a subcarrier measurement utility. Alternatively, a basic mod-monitor can be used alone, but program modulation and the stereo pilot must be turned off to resolve the low RDS injection level.

NOTE: If using a mod-monitor that does *not* have separate subcarrier measurement ability, keep in mind that mod-monitors are *peak-responding* for total modulation readings near 100% modulation, but may be *average-responding* for measurements at low levels of modulation. Because the RDS subcarrier is a complex, suppressed-carrier double-sideband signal, an average reading of 3% RDS injection can represent a level that is substantially higher when measured peak-to-peak. It is the *peak* level we are interested in with broadcasting.

Perhaps a better means of setting injection when a subcarrier monitor is not available is simply to bridge the input of the exciter with an oscilloscope using a BNC "T" adapter. With the audio program muted, the peak-to-peak value of the 19kHz stereo pilot signal can be noted. With this figure in mind, turn off pilot modulation (but do not *disconnect* the stereo generator) and set the peak-to-peak value of the RDS subcarrier to about one-third of the measured 19kHz pilot level. When programming is restored, the mod-monitor should indicate a 3% increase in total modulation, though this may be difficult to resolve near the 100% mark. Readjust the output level of the stereo generator to fine-tune the original total-mod figure.

In the United States, the FCC permits an extra 5% modulation for each subcarrier, with total modulation not to exceed 110% even with two or more subcarriers.

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SUBCARRIER PHASE

In the interest of maintaining optimum carrier modulation by the program signal, the 57kHz RDS subcarrier should be in quadrature with the 19kHz stereo pilot. Both in-phase and *quadrature* relationships are shown here in figures below, respectively. Note that a quadrature relationship yields a slightly lower peak level, which allows the greatest carrier modulation by the program audio signal.
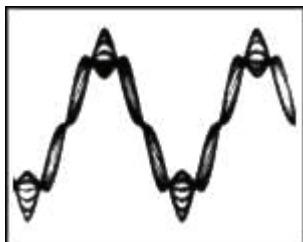
Subcarrier In-Phase
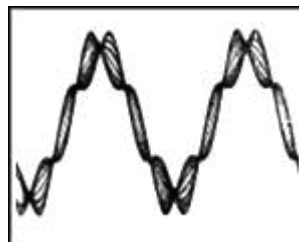
Subcarrier in Quadrature

The SmartGen 4 is skillfully and carefully aligned at the factory to ensure that the subcarrier is in quadrature with the stereo pilot, whether the encoder is used in the sidechain or in the loop-through operating mode. Although some stereo generators supply a pilot-sync reference for RDS (usually a TTL-level squarewave), this reference may or may not be in exact phase with the actual stereo pilot component of the composite/MPX signal. For this reason we recommend using the composite/MPX signal for synchronization. In the sidechain mode, the SmartGen 4 simply bridges the output of the stereo generator and does not load or otherwise compromise the composite/MPX signal.

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Programming Options

ADVANCED PROGRAMMING FOR STATION AUTOMATION

Developed as a fully 'interactive' RDS encoder, the SmartGen 4 can interconnect directly with station automation to transmit dynamic messaging to the receiver. Examples of this are song title and artist information, weather reports or air personality ID. Station automation communicates with the SmartGen 4 through an RS-232 serial data interface.

The data stream from a station automation system must be formatted properly for communication with the SmartGen 4 encoder. Commands require proper preambles, or headers, so that the SmartGen 4 interprets dynamic data as valid command sets.

SIMPLIFIED WINDOWS® DATA-ENTRY SOFTWARE

To help get RDS on-air quickly and painlessly, a very simple and intuitive Windows® interface has been included on the CD-ROM that comes with the SmartGen 4 encoder. This can be used by anyone to set the static IDs and flags, to program default entries into the dynamic messaging fields, and to set other operating parameters that affect how data from station automation is displayed on the radio faceplate.

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Loading and Running The Simplified Software

NOTE: To avoid hardware conflicts and encoder connection problems, install the software before attempting to connect the encoder with the computer.

INSTALLING THE SOFTWARE

Insert the supplied CD. The software has an 'autorun' utility to automatically begin the installation routine. However, in the event that the Setup Wizard does not automatically start, click Start, then My Computer, and then double-click the CD Drive (e.g. D:). Double click the file: SmartGen 4 RDS Encoder.exe to launch the Wizard (shown here) that will guide you through the several installation steps.
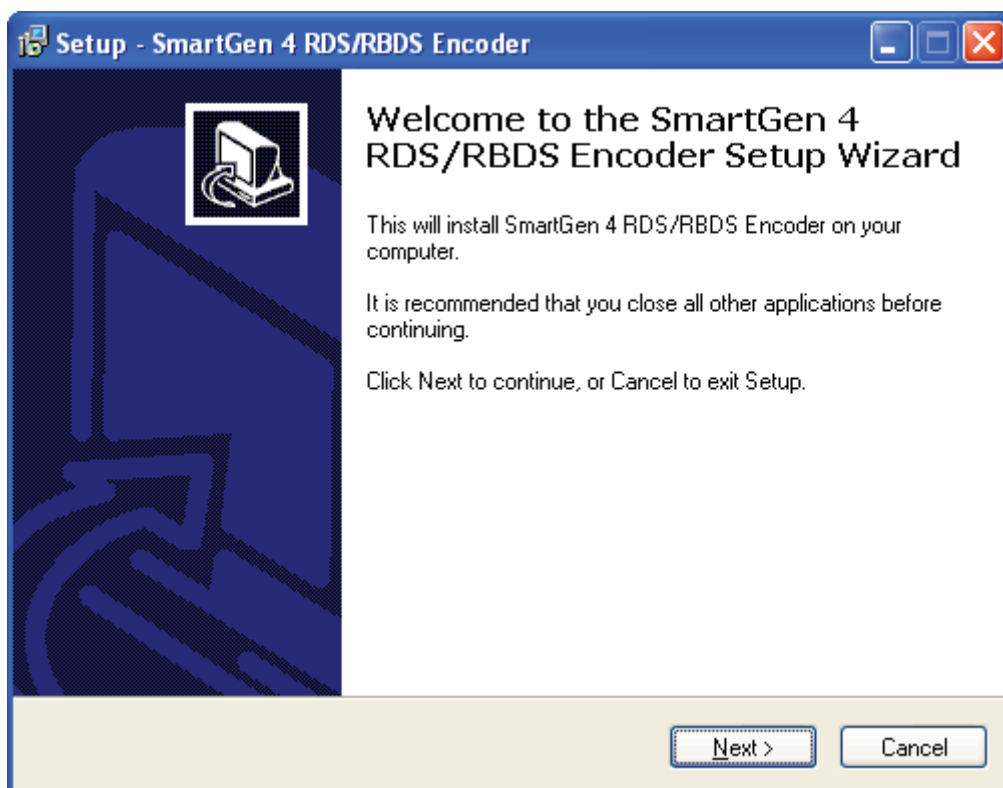
Unless you have a specific reason to make changes, simply accept the default recommendations and click Next> at each step, but with these exceptions:

1) When prompted to place an icon on the computer Desktop, check the box to do so.

2) At the final step, select NOT to launch the program.

3) Close the software installation utility.

Next, follow the procedure below to install the USB driver. If the front-panel USB port is NOT to be used, skip this procedure and follow instructions for RS-232 serial COM port interface.

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Installing The USB Port Driver

Once the programming software has been installed on the computer, a special USB port driver must also be installed if that particular computer is ever to address the encoder through the front-panel USB port. The station's 'utility laptop' or other machine used for quick, local encoder programming must have both the programming software and the USB driver installed.

When the programming software was installed, the USB driver was put into a folder within the SmartGen 4 program file. With a normal installation (as described above) under Windows® XP, the driver will have been located here: My Computer / Local Disk (C:) / Program Files / Deva Broadcast / SmartGen 4 RDS encoder / Drivers.

Use the following steps to install this driver:

1. With the SmartGen 4 Encoder powered-up, connect the front-panel USB port to the computer using the cable supplied. This should immediately bring up a New Hardware notification above the computer Taskbar and start the Found New Hardware Wizard. Select "Install from a list or specific location (Advanced)" and then: Next>.

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2. This next screen verifies the location of the driver, which should appear automatically in the box as shown. Click: Next>.

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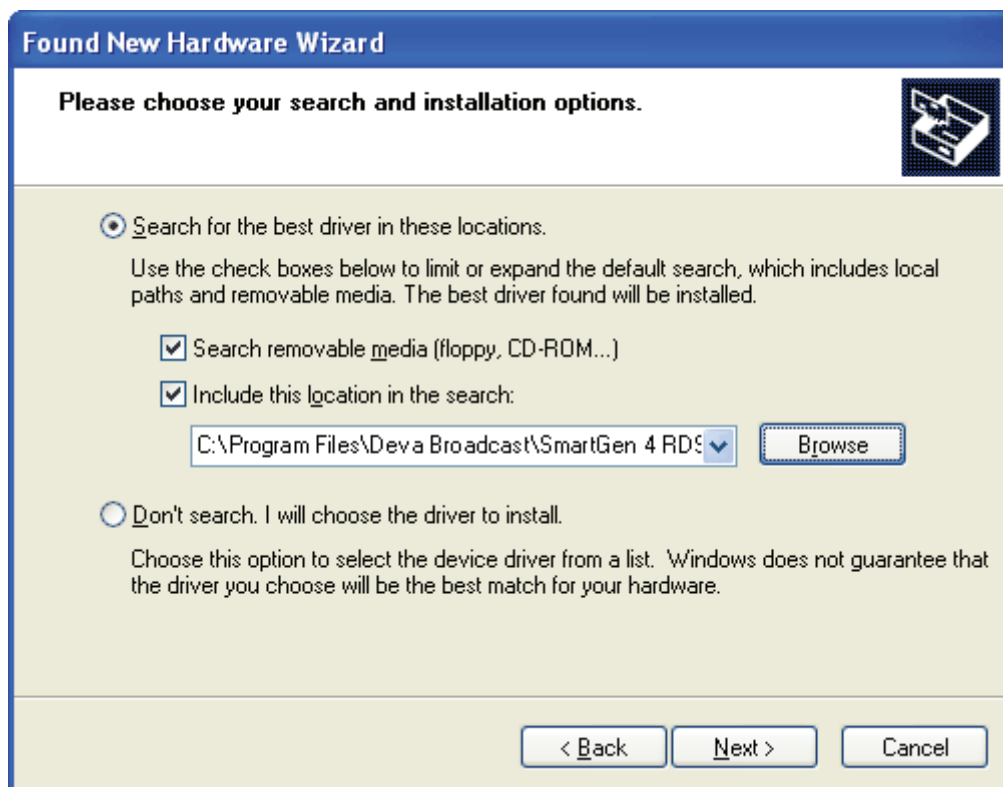
3. Windows® will advise that this driver is 'unsigned.' Trust us and click Continue Anyway.
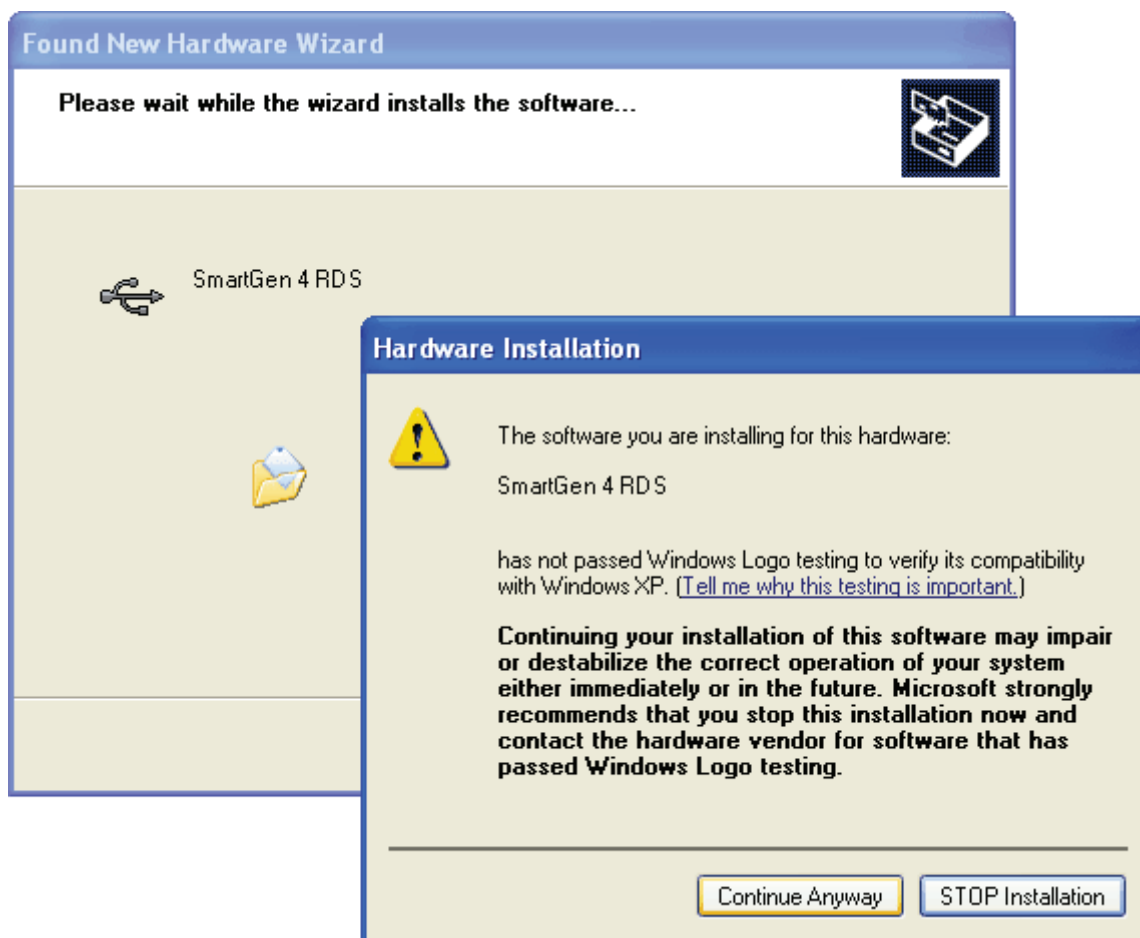
4. The driver will be installed, and a notification that the hardware is ready to use will appear above the Taskbar.
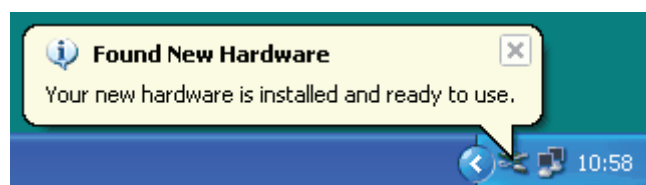
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The software installation will have placed an icon on your computer Desktop. Double-click the icon to start the data-entry software.

Before data can be uploaded to the encoder, software must be set for the proper communications mode.
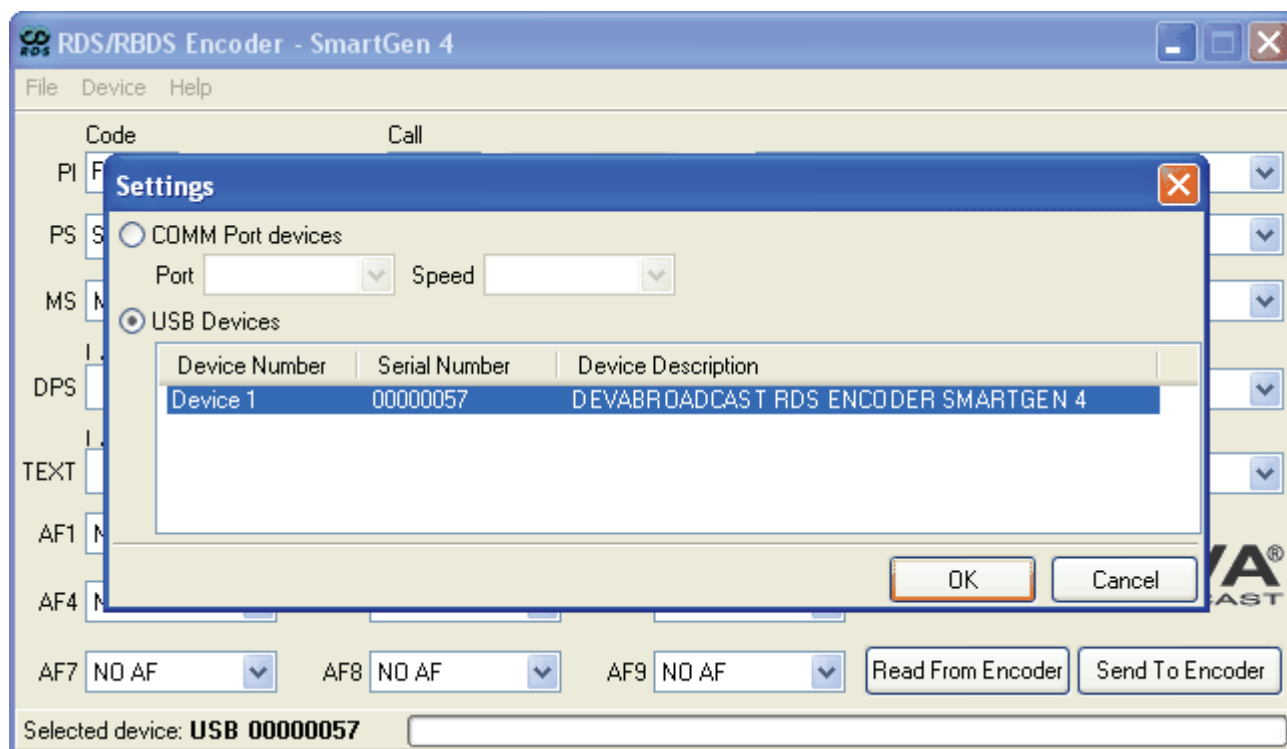
If you will continue using USB connectivity at this time, click on Device at the top of the data-entry screen. This will bring up the Settings box shown above. As a USB connection has already been established, the USB Devices bubble should be checked, and the actual serial number of this encoder's USB port will be listed as shown in the illustration.

NOTE: The port serial number shown is NOT the same as the primary, back-panel serial number of the SmartGen 4 Encoder. Each encoder is assigned a port ID so that multiple encoders can be addressed from a common USB hub if required.

To confirm the equipment selection, highlight the connected device (Device 1 in our illustration) and click OK. This will clear the Settings box and make the data-entry screen available.

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Serial (COM Port) Encoder Communications

The serial connection may be either a direct 'serial extension' cable, or it may utilize a link, such as a dial-up modem or a serial data link of the STL. These should be configured to appear 'transparent' to the programming process.

Software communications selection is called-up from the data-entry screen under: Device / COM Port devices. Clicking the bubble and setting serial port parameters, as shown below, enables encoder programming through the COM port.
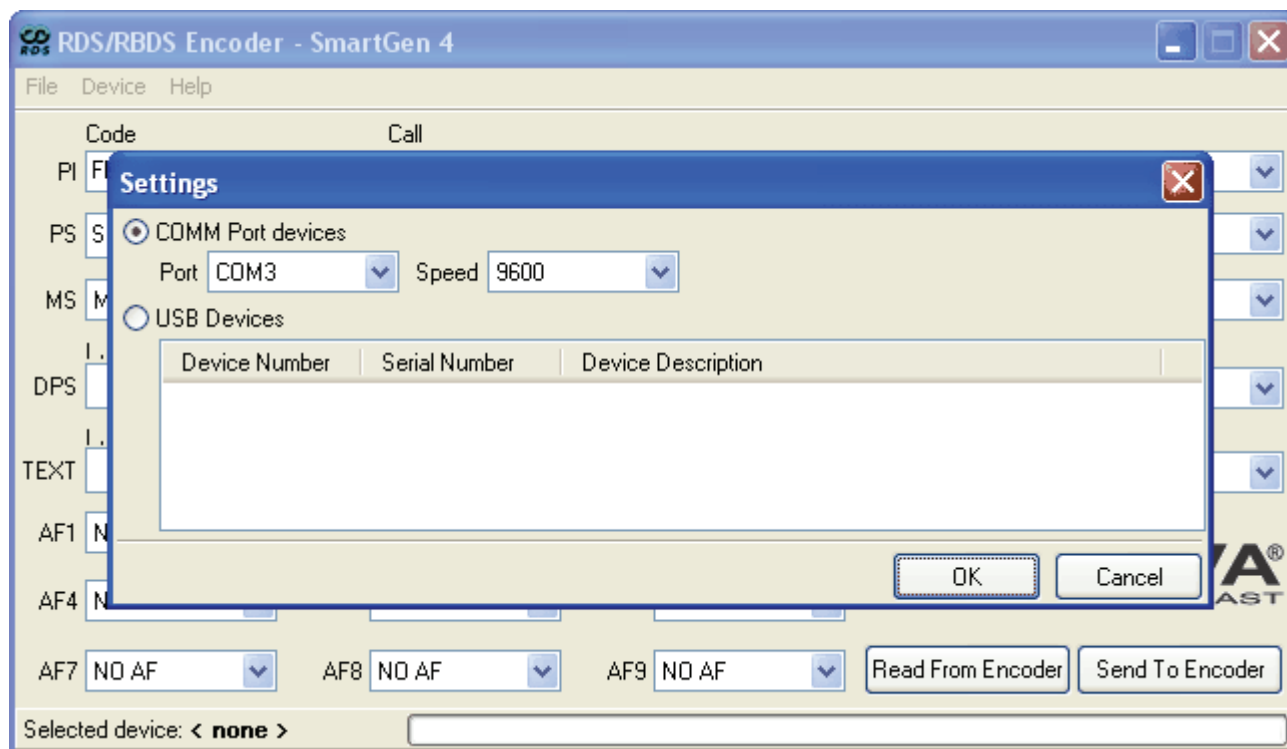
The SmartGen 4 can accommodate serial port baud rates between 2400 baud and 115200 baud. 9600-baud is the factory-default COM port rate. Because the volume of data sent is relatively small, a faster speed will not materially improve COM-port response time. However, a different rate may be used if, for instance, an RS-232 link associated with an STL is restricted to a lower baud rate. The encoder baud rate may be set through either the COM or the USB ports.

NOTE: When setting serial data SPEED on the data-entry screen, the selection will hard-set the encoder's COM port speed with the next Send to Encoder command. The supplied Windows® data-entry software automatically detects COM port speed and self-adjusts. This can be confirmed under Device / Settings, as shown above. But when the encoder is addressed by station automation that has a *hardware* baud-rate setting, communications will fail if the rates do not match. In this event, use the supplied Windows® software and a direct computer connection (via either the COM or the USB port) to hard-set the encoder baud rate to the fixed rate of the programming source.

The software installation will have placed an icon on your computer Desktop. Double-click the icon to start the data-entry software.

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The Data-Entry Screen

SOME NOTES ON DYNAMIC MESSAGING

Dynamic messaging can take either the 'approved' form of a RadioText message, which can be seen on the faceplate of only those radios equipped with INFO or DATA buttons, or it can be presented in the PS field through a technique that has come to be known as "scrolling-PS". This latter option is "forbidden" by the European CENELEC and United States NRSC standards committees, as it presents a distraction to automobile drivers. Nevertheless, both forms of dynamic messaging are in widespread use in the US and abroad.

In addition to dynamic messaging, there is a certain amount of obligatory, repetitive *static* information that is broadcast continuously over the RDS data stream. These are IDs and 'flags' that tell the receiver 'who is sending what, and how'. For all practical purposes, this information is fixed, and may be programmed (by local computer connection) into the non-volatile memory of the SmartGen 4 before connection to station automation for dynamic messaging.

RDS VS. RBDS MODE

Select the proper encoder operating mode before entering data. For North America (US, Canada and Mexico), the button indicated by the arrow here should be toggled to read: RBDS. For the rest of the world, it should be set to: RDS. This is important both for setting the PI code and to make sure that the proper PTY group is selected.
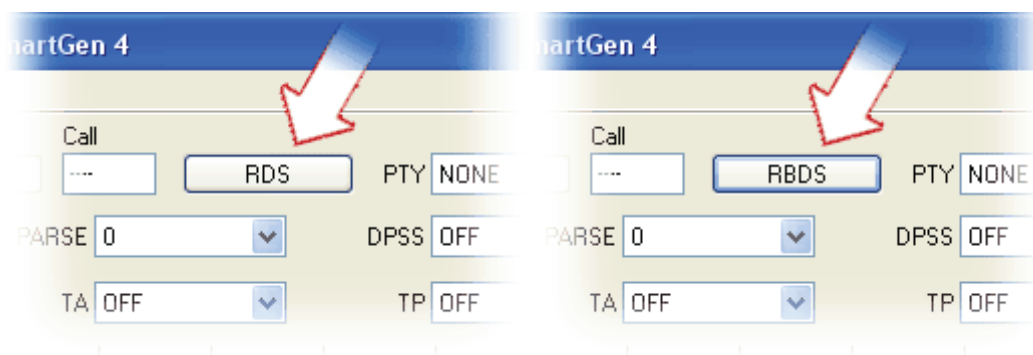
USING ALL-CAPS

Because many RDS radios cannot display a full set of ASCII characters, use of mixed (capitals and lowercase) letters can result in a very bizarre or completely unreadable message. Thus this Windows® data-entry software forces the use of all-capital letters. This same practice should be observed when the encoder is addressed by station automation.

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PI CODE CALCULATOR

The PI code is your station's 'digital address'. It is a hexadecimal code that is assigned by an appropriate broadcasting authority in most countries, but in the United States the PI code is numerically calculated from the station's callsign. We have provided a calculator utility within the SmartGen 4 software screen. This calculator is active only in the RBDS operating mode. An in-depth discussion of the mathematical calculation is given in section "Static Data Programming" on page 54.

To use the PI calculator for US 'K' and 'W' callsigns, simply enter call letters into the Call box and click the left-facing arrow. The hexadecimal code will automatically be entered in the Code box. If the hexadecimal code for a US station is known, you may enter it under Code, and then click the right-facing arrow to confirm a proper call letter match.
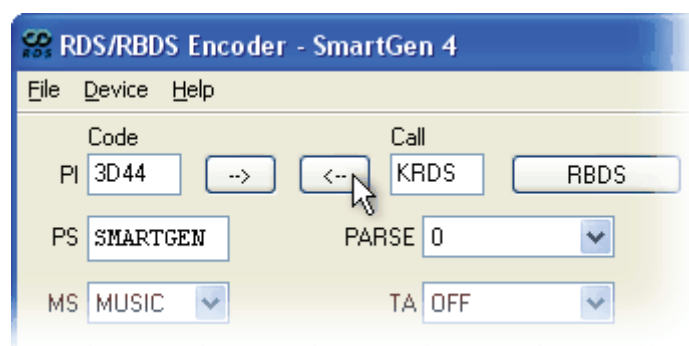
In all other countries the appropriate broadcasting authority is responsible for assigning the station's PI codes, which is then entered directly into the Code box. Canadian and Mexican codes should *never* bring up US-look-alike call letters when challenged by clicking the right-facing arrow! When in doubt: **1)** consult the broadcasting authority, **2)** check the latest published RDS Specification, or **3)** log onto the primary RDS information website: www.rds.org.uk for help.

The illustration below shows the data entry screen filled-in for a typical US rock station. Each of the entries will be explained individually, with references to page numbers in this Manual that further detail the discussed RDS function.

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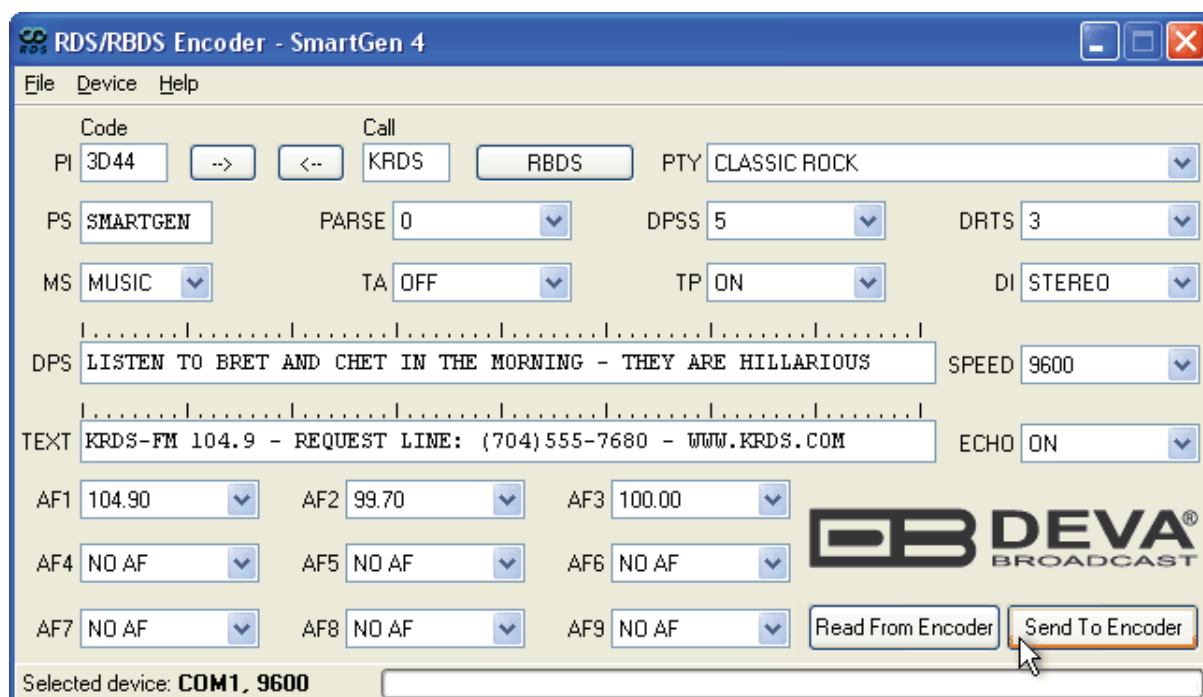
PI

As already explained, software automatically calculates the PI Code for US stations; otherwise the hexadecimal PI code must be entered manually in the (Code) PI field. PI coding is discussed in section "RDS Applications Supported" on page 14.

PTY

Program Type identifies the station's programming format from a list. There are two lists, one for the European RDS system and one for the American RBDS specification, hence the button that toggles between RBDS and RDS. With the proper geographical setting, choose the station format from the drop-down list. Refer to section "RDS Applications Supported" on page 14 for more information on PTY lists and their differences.

PS

The 8-character PS field is for the "street name" of the station. This will appear on the radio faceplate whenever a dynamic, scrolling-PS message is not being transmitted. PS is discussed in section "RDS Applications Supported" on page 14.

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PARSE

The SmartGen 4 encoder includes a built-in utility to 'parse' messages automatically when dynamic messaging is enabled (see DPSS). Parsing refers to the breaking-down of messages into meaningful segments for efficient display on the 8-character alphanumeric readout common to all RDS receivers.

PARSING DEFINED

Parsing is used in the "block" mode of message transmission, the more popular 'grouped-word' method. Once parsing options are set, this encoder function is valid for any scrolling-PS message, whether it is entered into the static DPS register, or received as ASCII text from station automation.

Very short words are sent together in groups. For instance, THIS IS constitutes seven characters that can be sent as a group. The same would hold true for OF THE or NOW HERE. Longer words, up to and including 8 characters, are sent individually: WARNING or DOUGHNUT or BICYCLE. The SmartGen 4 can either center words that are sent individually on the radio display or left-justify them. This will be covered along with the function of the PARSE button.

Words that exceed the available 8 characters are 'sidestepped' through two or more consecutive displays. Examples: EMERGENC followed by MERGENCY, or SUPERMAR followed by UPERMARK and PERMARKE and ERMARKET. This method of splitting words gives a good sense of continuity and readability.

"SAFE SCROLLING" EXPLAINED

Clicking on the PARSE button will show a drop-down menu of the numbers 0 through 9. With 0 or 9 selected, parsing action will be just as described. 0 centers word groups, 9 left-justifies them. Other choices are variations of what we call our "Safe Scrolling" message display mode and will be mentioned later.

We developed Safe Scrolling because of our concern over distracted car drivers. Viewing a message in the block mode (complete words or groups of words), a driver must pay close attention to the radio display, or risk missing part of the message. Although the message may be repeated over and over, the driver may tune in at the end of a song, and in finding out who sang the number could rear-end the car in front.

Safe Scrolling 'marches' the message across the display screen one character at a time, not unlike soldiers passing a reviewing stand. The message requires a much longer transmission time in this mode, but a glance at the radio display every ten to fifteen seconds still allows the driver to get the full message without missing words.

Setting PARSE to 1 will scroll the message one character at a time, as described. Other numbers also safe-scroll the message, but at 2, 3, 4, and up to 8 characters at a time. Selecting 9 will parse, as described, but text will be left-justified rather than centered on the display. 2 through 8 may be useful in some special RDS applications, but 0 and 1 are the primary PARSE selections. To recap: 0 will enable the more-popular, centered-auto-parsed block mode and 1 the Safe Scrolling, letter-by-letter option.

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DPSS

The speed of dynamic PS messaging is set here, or dynamic PS messaging can be turned off entirely. When OFF is selected, the dynamic PS message remains in the non-volatile encoder memory, but only the 8-character default static "street name" typed into the PS field will be displayed on the receiver faceplate.

Setting the speed at 1 will result in the slowest refresh rate of the 'block' message, or slowest Safe Scrolling. 9 is the fastest speed, but many RDS radios display gibberish at high speed settings. The display should be stable with any radio at a speed setting of 7 or lower.

DRTS

RadioText is the separate 64-character message that may be displayed on some radios when the listener pushes an INFO or TEXT button. Many automobile receivers will not allow RadioText display, hence the popularity of dynamic, scrolling-PS despite rules and cautions against its use. RadioText is sent as a single, 64-character message, so it generally needs to be refreshed less frequently in the normal RDS transmission cycle.

DRTS sets this RadioText transmission refresh rate. As a static RadioText message is not generally called upon to convey dynamic advertising or song-title information like the scrolling-PS function, a setting of 3 should be adequate. Higher settings may interact with other functions and compromise the stability of any scrolling-PS messages.

When DRTS is set to OFF, the RadioText message will not be transmitted. It will remain in the software and encoder memory, however.

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MS

Select MUSIC or SPEECH as the primary station format (see "RDS Applications Supported" on page 14).

TA

The TA flag is to be sent only for critical traffic-related announcements, and then only while the announcement is being broadcast. We fervently recommend using only direct-connected, hardware-switch-activation of the TA flag, as described in "Manually Activating the TA Flag" on page 24.

However, as the SmartGen 4 encoder may be some distance from the studio, and addressed by TCP/IP, serial (or modem) connection, provision has been made to set the TA flag with a software command. Selecting ON from the drop-down TA menu will set the flag, which will remain on until reset by selecting and sending OFF., or until the TA function times-out, if timeout has been programmed (see "Static Data Programming" on page 54).

TP

Set this to YES only if your station broadcasts traffic advisories and will activate the TA flag for critical announcements. This is clarified in section "RDS Applications Supported" on page 14.

DI

This is generally set for STEREO, unless the station has all-monaural programming and does not transmit the stereo pilot signal. DI is discussed in further depth in section "RDS Applications Supported" on page 14.

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DPS

Up to 64 characters of information may be entered in the Dynamic PS messaging field. This can be set either to 'parse' (see "PARSE" on page 39), or to scroll, one character at a time. Both the European CENELEC and the American NRSC specifications for RDS/RBDS operation expressly forbid 'Dynamic PS'. Nonetheless, dynamic messaging is flaunted in the face of these august agencies and is currently practiced worldwide.

The tic marks above the DPS entry field are useful in manually formatting dynamic, scrolling-PS messages that are not automatically parsed; that is, broken into sensible groups by SmartGen 4 software. The following illustration shows how one can manually format a scrolling PS message for optimum readability. This same illustration may prove valuable when it comes to deciding how to format non-parsed messages within station automation software.

NOTE: In this illustration, the menu that drops-down from the PARSE button would be set to 8, meaning that the full eight characters available on the radio faceplate would be sent as a group at each transmission interval. Again, the automatic parsing function of the SmartGen 4 Encoder is not called into play for this illustration.

When simply scrolled, one character at a time (PARSE = 1), the message shown in the example here could be read easily, although it would take about a minute for all characters to march sequentially across the receiver faceplate. Alternatively, automatic parsing (PARSE = 0) would break the message into independently-meaningful groups with much faster message throughput.

But as it is typed in the example above, and with PARSE set to 8 (corresponding to the limit of the receiver display), the message would show up something like this:

By altering the text slightly and forcing the message to break into standalone clusters of eight characters, 'block' transmission of essentially the same message would be far more readable. Here is an example of how the message could be formatted:

Each sequentially-displayed 8-character 'screen' would break at the major tic marks and show up on the radio faceplate as shown below.

Keep in mind that the SmartGen 4 parsing utility can automatically perform this word-breaking function in encoder firmware. This illustration simply shows how parsing can be implemented manually. Additional discussion of dynamic PS modes and formatting may be found under advanced programming notes in section "Scrolling Display And Dynamic Encoder Operation" on page 61.

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TEXT

The 64-character RadioText buffer holds a static message that can be called up for viewing on home RDS receivers and on some auto radios. Please see further information on RadioText in section "RDS Applications Supported" on page 14.

The entire 64-character RadioText message is transmitted as a block. If so equipped, the receiver will buffer RadioText and display it as a scrolling message automatically, hence there is no need to observe word breaks or perform other message formatting tasks.

SPEED

This refers only to COM port serial communications with the encoder, although the RS-232 rate may be set using the front-panel USB connection. See additional information in section "Serial (COM Port) Encoder Communications" on page 35.

ECHO

The SmartGen 4 can be set either to echo RS-232 programming commands back to the computer or automation system, or not. The option is not important when using the supplied Windows® interface, but may have implication when addressing the encoder from a 'dumb terminal' or with station automation.

AF1 THROUGH AF9

Rebroadcast 'translators' or stations on a network may air the very same program on multiple frequencies. Only when the program is heard at the same time (synchronously) at different dial settings is the associated frequency considered a true "alternative frequency."

NOTE: When AFs are listed, the station's primary frequency must also be in the list. AF frequencies are selected from a drop-down menu associated with each AF button.

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SENDING DATA TO THE ENCODER

Once all information is entered into the various fields, clicking the Send To Encoder button will upload all RDS data to non-volatile encoder memory. As data is received by the SmartGen 4, the appropriate ACTIVE PORT indicator on the front panel will flash perceptibly.

Data transfer takes about 3 seconds, with progress indicated by a progress bar at the bottom of the window. Done. is displayed when transfer is complete, and if transfer is not successful for any of a number of reasons, an error message will be shown. The Done. message box must be cleared before further data can be entered.

READING DATA FROM THE ENCODER

In a situation where the RS-232 data link is lost, once communication has been reestablished data may be read from the encoder to verify what is currently being broadcast. Clicking: Read From Encoder will copy all entries from the encoder buffer to the software screen.

The data resident in the SmartGen 4 encoder memory may be downloaded back onto the software screen without interrupting RDS transmission. This feature is useful for updating only certain fields of RDS data being transmitted without having to re-enter everything. Download by clicking Read From Encoder, make changes in any of the fields, and then upload the revised file back to the encoder with a Send To Encoder command.

FILE MANAGEMENT

All the RDS programming information that is represented by the filled-in data entry screen may be also saved as a file on the computer hard drive. This is useful when various programming segments throughout the broadcast day have dedicated RDS messaging, or when messages need to be replaced within a programming segment with updated advertising or program promo information.

Data on the screen may be saved as a file before, after, or instead of sending information to the encoder. Clicking in the menu bar on: File / Save As… will prompt you for a location and name for the file, which will have a .ino extension. The file may be named in keeping with its content and stored on the computer Desktop, or in a folder created and set aside for this purpose. To import a saved .ino file onto the screen, click on File / Open and browse to the directory and folder where the .ino file has been saved. Double-click the file to bring the RDS programming information onto the screen where it then can be sent to the SmartGen 4 encoder with: Send To Encoder.

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Programming Port Priorities

The RS-232 serial COM port is the default programming connection, but the front-panel USB port has priority over the COM. This allows local reprogramming of static data without disconnecting a station automation serial connection. The USB cable must be unplugged, or the local program closed, before the COM port can again receive data.

Hardware Configuration

Configuration of the terminal, computer or automation system obviously will depend on parameters placed by hardware and firmware. For simplicity, the encoder serial (COM port) programming illustrations in this section will utilize HyperTerminal, the terminal emulation program by Hillgraeve, Inc., developed for Microsoft and supplied with the Windows® operating system. It is hoped that programming instructions based on terminal emulation will help the programmer understand what ASCII syntax the encoder requires, serving as an example for direct-connection with station automation.

If using HyperTerminal, it's best first to upgrade to the latest version. Download this at no charge from www.hilgraeve.com/htpe. The more current product seems to run more smoothly and has text editing features not found in earlier versions.

NOTE: Do not connect the SmartGen 4 Encoder until the HyperTerminal program has been configured properly.

HyperTerminal is started under Windows® with the command routine: Start / Programs / Accessories / Communications / HyperTerminal. Double-click: HyperTrm.exe. This brings up the main HyperTerminal screen with a Connection Description window for naming your encoder communications program. How this connection is configured depends on the serial (COM) port will be addressed.

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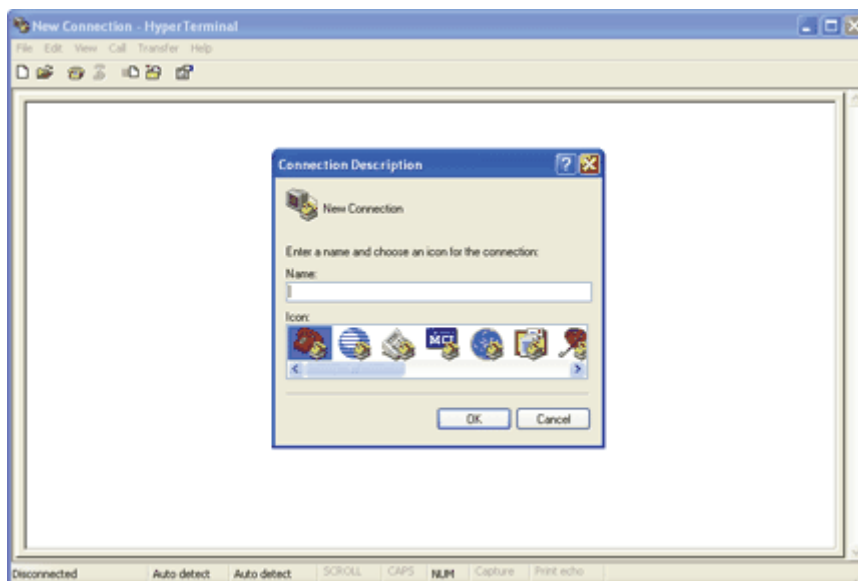
SERIAL COM PORT CONFIGURATION

Give the encoder connection a name; we have chosen RDS for this illustration. Click Connect using and select COM1, unless there is a reason to use another serial COM port. Click OK.

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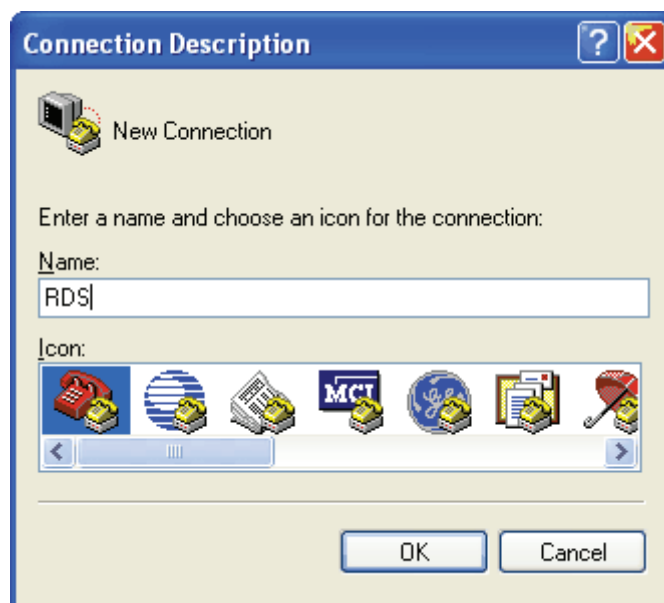
The next window that appears shows COM1 Properties. Here you set the communications parameters as follows: Bits per second: 9600, Data bits: 8, Parity: None, Stop bits: 1, Flow control: None. Check your settings against the screen shot. Click OK to close all boxes and to clear the HyperTerminal data entry screen.
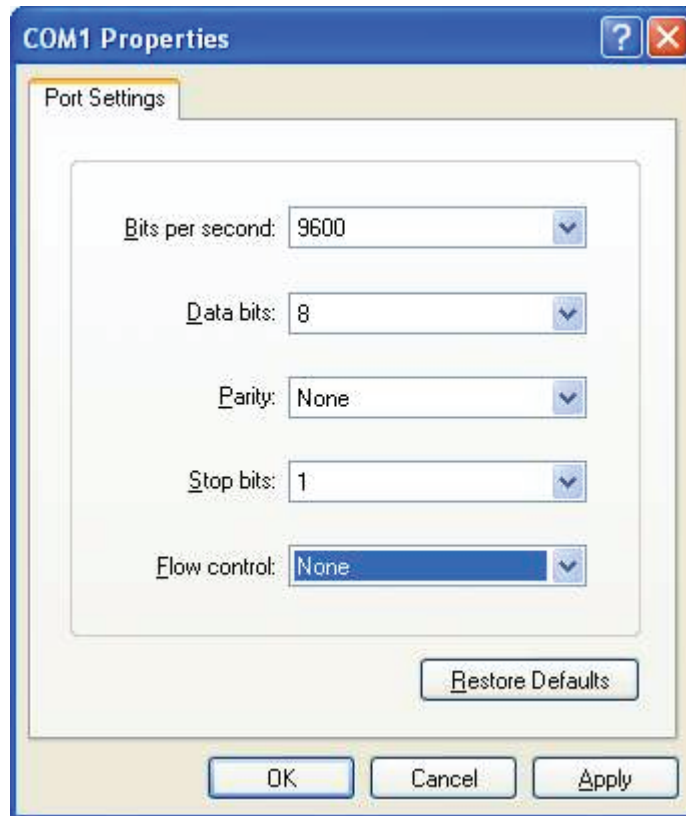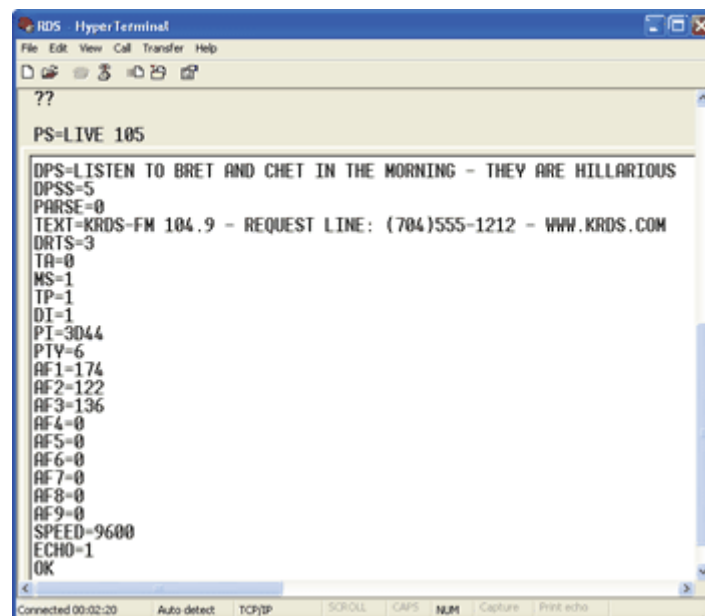
If you experience trouble communicating with the SmartGen 4, there's a quick and easy check to verify that the computer and the terminal program are functioning normally. With pins 2 and 3 of the DB-9 connector shorted with a screwdriver, whatever is typed on the keyboard should appear on the screen.

When COM port setup is complete the computer may be connected to the encoder COM port. Next, skip to Power-Up, below.

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POWER-UP
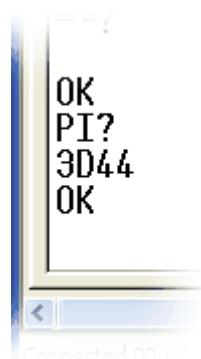
Once the encoder is connected (by the serial COM) and powered-up, communications should be automatic. A notation at the bottom of the HyperTerminal screen verify connection.

Type: ??↵ (two question marks followed by Enter). This will cause the encoder to send back the contents of all ID, flag and message registers, which (shown here) are the data entered previously (see "The Data-Entry Screen" on page 36). This double question mark can be used at any time to make the encoder 'spill its guts'. This exercise does not interrupt or interfere with encoder operation.

All valid interrogations are followed by: OK; a NO shows that the interrogation was not valid. Any single parameter in a register can be interrogated independently. Simply type the register designation followed by a single question mark. A response shown at the right for the typed command: PI?↵

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ECHO

It's best for your computer screen to display what has been "echoed" by the encoder as data is entered. Each character typed on the keyboard is sent to the encoder, which turns it back around to be shown on the monitor screen. This round trip gives continuous confirmation of 2-way communications. Typing ECHO=1↵ will provide this round-trip communications verification.

The return data path is not essential, however. The SmartGen 4 will accept programming commands on a receive-only basis. For example, a studio-transmitter radio link (STL) may include 1-way data transmission that could be used to address the encoder.

If double characters appear when typing, your terminal has been configured for local echo. Rather than defeating the echo function of the encoder, local echo should be turned off. This is usually a software command in the terminal or terminal program. Local echo must be used with a 1-way link, however, so that the terminal screen will show what is typed.

The SmartGen 4 has been set to echo as the factory default. The command to turn echo off is ECHO=0↵. To turn echo back on again, type ECHO=1↵.

Programming Syntax

HOW TO TYPE

In these programming instructions the exact ASCII syntax to be entered on the keyboard will be given in the font used in this example: DPS=HELLO↵. Specifically, the field: DPS, the equal sign and the word HELLO would be typed, followed immediately by pressing the Enter key. We will use ↵ as the symbol for Enter.

Take time to type deliberately and slowly. Even at 9600 baud, some delays are inherent in the communications between the computer and the encoder. One characteristic of typing too quickly will be the omission of line feeds in responses returned from the encoder.

USING ALL-CAPS

Programming commands should be typed in ALL CAPS (capital letters) and messages should be kept as simple as possible. Though the encoder will accept lowercase letters and all ASCII punctuation in the DPS and TEXT fields, RDS radio displays have limited character sets and may show ambiguous lowercase characters or gibberish. To assure readability, keep the keyboard Caps Lock key engaged and avoid fancy punctuation. 'Smileys' are not a good idea.

CORRECTING MISTAKES

Under HyperTerminal, use the Enter key to drop to a new line, if required, and use either the Backspace key or the keyboard's directional arrows to navigate within a text entry. Overtyping an entry will automatically replace the previous characters. What is shown on the screen before the Enter key is pressed is what will be sent to the encoder.

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VALIDITY SYMBOLS

The SmartGen 4 ignores ASCII inputs that do not conform to proper formatting rules. This is an important feature when the encoder is connected full-time to station automation. When a valid command is accepted by the encoder, it returns OK to the computer screen. If a data input is properly formatted, but is ambiguous or otherwise not accurate, the screen will display NO. Examples of valid and invalid commands are shown below. Follow programming instructions *exactly* to ensure that commands will be accepted.

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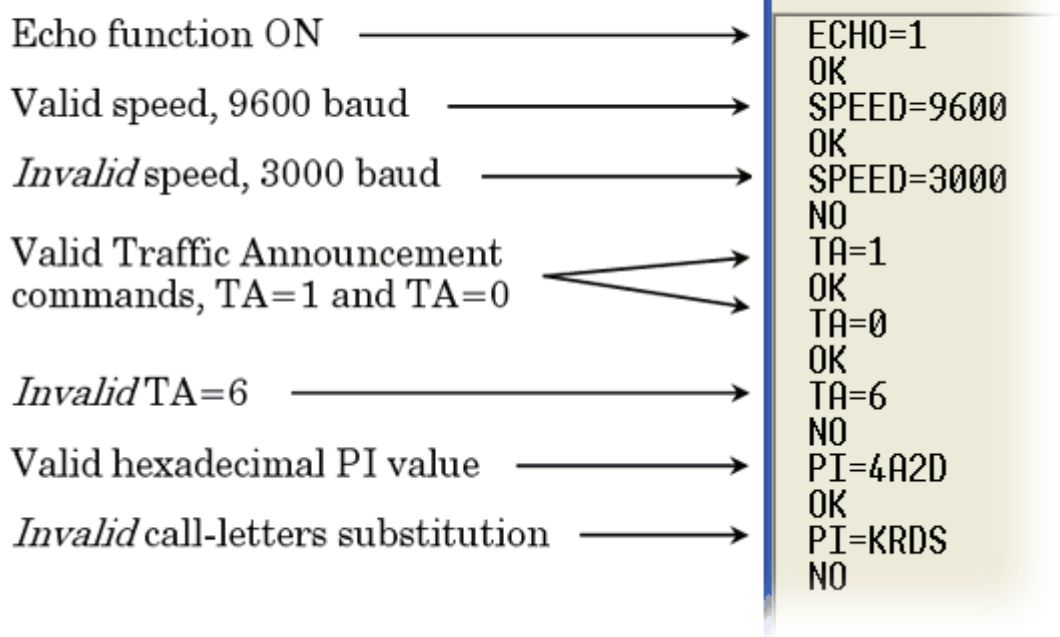
Encoder Housekeeping Commands

REGISTER INTERROGATION

Typing: ??↵ (two question marks followed by Enter) returns the status of all flag and ID settings and the contents of static message buffers to the screen. This was illustrated in section "Power-Up" on page 49".

ENCODER INITIALIZATION

The "initialize" command is invoked by typing: INIT8 . This is used to reestablish encoder operation in the unlikely event of an internal software 'crash,' or for any other reason to restore all the factory defaults. INIT↵ is an emergency recovery command only. It is not necessary to execute INIT↵ prior to updating any encoder programming.

SAVING ENTRIES

Once the RDS parameters have been set-up, or after any updates have been made, type: SAVE↵ to write data to non-volatile memory. The SAVE↵ command may be executed at any time during the data entry process to protect everything entered to that point, and executed again when all entry is complete.

ENCODER RESET

Typing: RESET↵ initiates a 'hardware reset' equivalent to turning the encoder off and back on again. This reset command does not clear the registers of programming commands that have been saved as described above.

FIRMWARE VERSION

Type: REV↵ for a display of the encoder's firmware version. This might prove important in determining whether differences exist between SmartGen 4 encoders purchased at different times.

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Static Data Programming

The following instructions describe the 'hard way' of programming the various IDs, flags, and static text messages. This programming is accomplished very easily using the Windows® data-entry software supplied with the encoder. Only the abbreviations of the functions are given. Refer to section "RDS Applications Supported" on page 14 for in-depth parameter descriptions.

PI CALCULATION

In Europe and in some other parts of the world, an appropriate bureaucracy assigns the PI code for RDS transmissions. PI is a hexadecimal number that becomes the station 'digital address'. In the US the PI code is mathematically calculated from the station's call letters using a formula published in the US RBDS Standard. This is a copious process, that's why we built a calculator into the Windows® software supplied with the SmartGen 4.

The manual PI calculation method shown here is valid only for four-letter calls. Three-letter calls have been preassigned. These are published in the RBDS Standard.

For the manual method, each letter of the alphabet is assigned a number value according to the following list:

A	0	H	7	O	14	V	21
B	1	I	8	P	15	W	22
C	2	J	9	Q	16	X	23
D	3	K	10	R	17	Y	24
E	4	L	11	S	18	Z	25
F	5	M	12	T	19		
G	6	N	13	U	20		

Now follow these simple steps to calculate the PI. Here we have provided an example for Radio Station KWAV.

1) Take the number value of the fourth letter of your call and write it at the top of a column.	V=21	21
2) Take the number value of the third letter of your call, multiply it by 26 and add it to the column.	A=0 (X 26)	0
3) Take the number value of the second letter of your call, multiply it by 676 and add it to the column.	W=22 (X 676)	14872
4) If your call begins with a K, add 4096 to the column. If it begins with a W, add 21672.	K (add 4096)	4096
		--------
5) Add the column up.		18989

This gives a decimal number value for your call letters, which now has to be converted to hexadecimal for the PI entry.

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The easiest way to convert from decimal to hexadecimal is with the Windows® accessory calculator. Bring the calculator up with the sequence: Start / Programs / Accessories / Calculator. Then select: View / Scientific and verify that the Dec (Decimal) box is checked. Enter your decimal sum with the keyboard keypad as shown below.
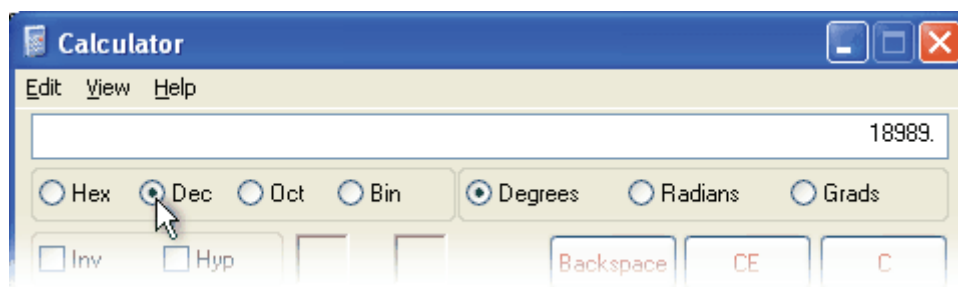
Next check the Hex box. The hexadecimal value will be displayed on the calculator as shown at the top of the next page.
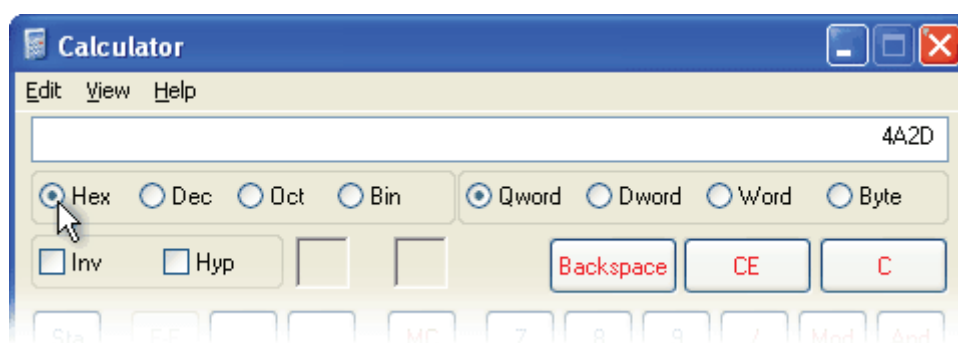
The hexadecimal conversion shown in the example is 4A2D. This is an alphanumeric value containing both letters and numbers. Some PI codes may contain only numbers, but all will have four characters. Our four-character example is entered by typing: PI=4A2D↵

PS

The Program Service Name is your station's "Street Name". This may be simply the call letters, KBAD or KBAD-FM or a slogan such as LIVE 105. Up to 8 characters (including spaces) may be accommodated. Enter by typing: PS=xxxxxxxx↵ , where x represents the entry in capital letters. (A discussion and instructions for scrolling-PS begin in section "Scrolling Display And Dynamic Encoder Operation" on page 61.)

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PTY

"Program Type" indicates the station format. The listings shown below were assigned by the NRSC in the United States and by CENELEC for the rest of the world. Be sure to select your format from the proper list!

The numbers in the PTY column indicate the categories listed in the appropriate standards. Enter this number into the encoder's PTY field by typing: PTY=n↵ or PTY=nn↵ , where n or nn is the number shown in the PTY column below.

PTY	US (NRSC)	EUROPE (CENELEC)
0	None	None
1	News	News
2	Information	Current Affairs
3	Sports	Information
4	Talk	Sports
5	Rock Music	Education
6	Classic Rock Music	Drama
7	Adult Hit Music	Culture
8	Soft Rock Music	Science
9	Top 40 Music	Varied
10	Country Music	Pop Music
11	Oldies Music	Rock Music
12	Soft Music	Easy Listening Music
13	Nostalgia Music	Light Classics Music
14	Jazz	Serious Classics Music
15	Classical Music	Other Music
16	Rhythm and Blues Music	Weather
17	Soft R and B Music	Finance
18	Foreign Language	Children's Programs
19	Religious Music	Social Affairs
20	Religious Talk	Religion
21	Personality	Phone-In
22	Public Non-Commercial	Travel
23	College	Leisure
24	(unassigned)	Jazz Music
25	(unassigned)	Country Music
26	(unassigned)	National Music
27	(unassigned)	Oldies Music
28	(unassigned)	Folk Music
29	Weather	Documentary
30	Emergency Test	Alarm Test
31	Emergency!	Alarm!

NOTE: PTY codes 30 and 31 are reserved for true emergency and emergency test situations only. Consult the appropriate Standards Group for using these PTY codes.

Also please take care in coding the PTY identifier, as the categories can be ambiguous. For instance, what if yours is a college station that relays NPR programming? How about Rock and Top 40 crossovers? Just what can Cultural possibly pertain to in the 21st Century? Would Serious Classics dare to include Stravinsky or Bartok? For clarifications on these and other burning questions, refer to the appropriate RBDS or RDS Standard, or put your question directly to the Standards Group. Don't ask us, this is not in our job description!

The PTY identifier can be made into a semi-dynamic function. It can be changed from one entry to another if your station "dayparts" (alters formats during specific, extended periods). The PTY should not change from song to song or to accommodate a 5-minute newscast, however.

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TP

If yours is a station that transmits travel advisory updates on a regular basis, type: TP=1↵ . If you do not broadcast travel information, type: TP=0↵ .

TA

The Travel Announcement flag can be software-activated by typing: TA=1↵ , but must be turned off by typing TA=0↵ immediately when the announcement ends. TA is most easily and safely activated with a hard-wired switch closure at the announcer's position (see "Connecting The SmartGen 4" on page 21). Leave the software command set at TA=0↵ and use the switch!

TA TIMEOUT

An optional safety feature has been built into the SmartGen 4 to guard against an extended software-activated TA flag. Say, for example, that the TA flag was activated by the software command: TA=1↵ , and the data link was suddenly lost. No TA=0↵ command would be received, and the TA flag would remain raised indefinitely. As this is not a good thing, an automatic timeout option has been included for software-activated TA flags.

Timeout can be set between 1 and 9 minutes. To enable this feature, type: TATIME=m↵ , with the value of m between 1 and 9. This will automatically reset the TA flag to TA=0 after the programmed time has elapsed.

As received, this timeout feature is disabled. Type: TATIME?↵ . A zero returned from the encoder shows that the feature is turned off. The feature is disabled by typing: TATIME=0↵ .

NOTE: The timeout should not be used to define the actual period that the TA flag is raised. The TA flag must be reset to zero immediately following a traffic announcement. Again, it's best to use the manual switch option for this command as described in section "Connecting The SmartGen 4" on page 21.

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AF

As many as 9 Alternative Frequencies may be entered in to the SmartGen 4. These are optional frequencies that carry the very same program as the main channel, as in a network or translator situation.

Alternative frequencies are actually transmitted as special AF channel numbers. The RDS receiver logs these channel values and uses them in the process of finding a stronger signal of the identical program, either from another station on a network or from a rebroadcast translator.

The SmartGen 4 has nine registers for alternative frequencies. Each register must have a numerical value assigned and entered into it. Any register that is not used for an alternative frequency must have a 0 (zero) value inserted. The factory default is a zero in all registers.

Alternative frequency channels begin with Channel 1 at 87.6MHz, and go in 100kHz increments up to Channel 204 at 107.9MHz. The following table converts frequency to AF channel numbers.

To enter the alternative frequency of 98.1MHz into register one, type: AF1=106↵ . To enter the alternative frequency of 107.7MHz into register two, type: AF2=202↵ . Enter a value into all nine registers. If only a couple of alternative frequencies are entered be sure that a 0 (zero) is typed into any unused registers. Typing: ??↵ will confirm the contents of the nine AF registers.

NOTE: The alternative frequency utility requires that the station's *main frequency* be entered into one of the registers, whether that station has translators or not. Be sure to enter the primary frequency of the station into one of the registers, and that zeroes are in unused registers.

MHz	CHAN		MHz	CHAN		MHz	CHAN		MHz	CHAN
87.6	1		92.7	52		97.8	103		102.9	154
87.7	2		92.8	53		97.9	104		103.0	155
87.8	3		93.9	54		98.0	105		103.1	156
87.9	4		93.0	55		98.1	106		103.2	157
88.0	5		93.1	56		98.2	107		103.3	158
88.1	6		93.2	57		98.3	108		103.4	159
88.2	7		93.3	58		98.4	109		103.5	160
88.3	8		93.4	59		98.5	110		103.6	161
88.4	9		93.5	60		98.6	111		103.7	162
88.5	10		93.6	61		98.7	112		103.8	163
88.6	11		93.7	62		98.8	113		103.9	164
88.7	12		93.8	63		98.9	114		104.0	165
88.8	13		93.9	64		99.0	115		104.1	166
88.9	14		94.0	65		99.1	116		104.2	167
89.0	15		94.1	66		99.2	117		104.3	168
89.1	16		94.2	67		99.3	118		104.4	169
89.2	17		94.3	68		99.4	119		104.5	170
89.3	18		94.4	69		99.5	120		104.6	171
89.4	19		94.5	70		99.6	121		104.7	172
89.5	20		94.6	71		99.7	122		104.8	173
89.6	21		94.7	72		99.8	123		104.9	174
89.7	22		94.8	73		99.9	124		105.0	175
89.8	23		94.9	74		100.0	125		105.1	176
89.9	24		95.0	75		100.1	126		105.2	177
90.0	25		95.1	76		100.2	127		105.3	178
90.1	26		95.2	77		100.3	128		105.4	179
90.2	27		95.3	78		100.4	129		105.5	180
90.3	28		95.4	79		100.5	130		105.6	181
90.4	29		95.5	80		100.6	131		105.7	182
90.5	30		95.6	81		100.7	132		105.8	183
90.6	31		95.7	82		100.8	133		105.9	184
90.7	32		95.8	83		100.9	134		106.0	185
90.8	33		95.9	84		101.0	135		106.1	186
90.9	34		96.0	85		101.1	136		106.2	187
91.0	35		96.1	86		101.2	137		106.3	188
91.1	36		96.2	87		101.3	138		106.4	189
91.2	37		96.3	88		101.4	139		106.5	190
91.3	38		96.4	89		101.5	140		106.6	191
91.4	39		96.5	90		101.6	141		106.7	192
91.5	40		96.6	91		101.7	142		106.8	193
91.6	41		96.7	92		101.8	143		106.9	194
91.7	42		96.8	93		101.9	144		107.0	195
91.8	43		96.9	94		102.0	145		107.1	196
91.9	44		97.0	95		102.1	146		107.2	197
92.0	45		97.1	96		102.2	147		107.3	198
92.1	46		97.2	97		102.3	148		107.4	199
92.2	47		97.3	98		102.4	149		107.5	200
92.3	48		97.4	99		102.5	150		107.6	201
92.4	49		97.5	100		102.6	151		107.7	202
92.5	50		97.6	101		102.7	152		107.8	203
92.6	51		97.7	102		102.8	153		107.9	204

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DI

Though this identifier is not presently used to any great extent, to be on the safe side type: DI=1↵ if you are a stereo station, and type: DI=0↵ if you broadcast only in monaural.

M/S

The utility of this flag also is obscure. Nevertheless, it is recommended to type: MS=0↵ if your broadcast day is primarily speech, such as All-News or Talk Radio, and type: MS=1↵ if music makes up the bulk of your programming.

RT

RadioText is the static message that appears on the faceplate when the listener presses and INFO button, on radios so equipped. This is not to be confused with the PS field, which can be either static or dynamic. Some stations make RadioText a dynamic function, changing the message at intervals to promote an upcoming broadcast, to announce results of a contest, or to send advertising messages. We recommend that you program a default RadioText message into static memory and initiate a SAVE↵ command. This will ensure that the RadioText field will not be empty following a power outage or loss of the data link.

To enter the static RadioText type: TEXT=$x_1 x_2 x_3 \ldots x_{64}$↵, with x representing up to 64 uppercase characters, including spaces; a RadioText message may be shorter than 64 characters, however.

Even with a default message saved in non-volatile memory, RadioText is updated simply by entering new data. This may be done manually from a computer or terminal, or automatically by station automation for messages that change during the day. When connecting the encoder's RS-232 COM PORT to the automation system, be sure that the system is configured for the proper data rate and programmed to give the TEXT=... header when sending data.

RADIOTEXT RATE

Generally, RadioText is updated less frequently than IDs and flags to speed the radio's search for formats, traffic information and alternative frequencies. The tradeoff is that text messages are sent and updated less frequently. There will always be a tradeoff between RadioText throughput and speed of other RDS functions, including AF-seek and either static or scrolling-PS displays.

The RadioText update rate is programmed by typing: DRTS=n↵ , with n a number between 1 and 9, corresponding to a refresh rate between slow and fast, respectively. Keeping the throughput tradeoff in mind, unless RadioText is being used for contests or for other quasi-dynamic activities, it is best to use a lower number. A rate of 1, 2 or 3 will make little difference in the speed of other RDS functions.

NOTE: RadioText can be turned off entirely by typing: DRTS=0↵ . A zero value in this field turns the RadioText message off, but does not delete any saved message from memory.

FREE FORMAT GROUP

The encoder can transmit two unspecified data groups for in-house remote control, restricted paging or similar proprietary applications. This feature can be static, with the same data transmitted repeatedly, or controlled by an external application as a dynamic function.

The two "free data" groups are known as the 'G' and 'H' groups. Each contains three hexadecimal ASCII blocks of data. To enter data into these groups, type: G=bbbbccccdddd↵and/or: H=bbbbccccdddd↵. The blocks represented by bbbb, cccc and dddd are the RDS B, C and D data blocks. Certain hexadecimal values in these blocks may already be in use for RDS functions supported by the Smarten 4 encoder. Consult the applicable RBDS or RDS Standard for more information on how these data can be used.

SAVING ENTRIES

Once all data have been entered, execute a SAVE↵ command to write your entries to non-volatile memory. Data held in non-volatile memory is loaded into working memory following a power-up or a RESET↵command. Saving to non-volatile memory is a precautionary measure and does not limit dynamic operation.

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Scrolling Display And
Dynamic Encoder Operation

SAFETY CONSIDERATIONS

The concept of scrolling text messages on the dashboard of a car, in plain view of the driver, is the subject of discussion and debate within the broadcast community and with transportation safety agencies. It should be a matter of common-sense concern to the responsible broadcaster as well.

Deva Broadcast takes a cautionary, conservative view of dynamic message displays in plain view of an automobile driver. The CENELEC and NRSC standards groups have expressly forbidden this practice for good reason. Proponents argue that GPS and other navigational aids in cars pose a similar and equal hazard, even though these displays are often more of a 'heads-up' display than the faceplate of a dash-mounted radio. Indeed, propping a paperback mystery novel on the car's steering wheel is more 'heads-up' than the radio faceplate, but do these scrolling display proponents condone reading while driving, we wonder? It is our recommendation to relegate visual readouts to display only essential information, and in a manner that poses the least distraction.

RADIOTEXT

RadioText is transmitted as a 64-character block of data. The presentation of this display has been left to receiver manufacturers. Some home receivers can actually show the entire message at once, whereas other radios must scroll the message in a limited window. A good number of auto radios simply do not support Radiotext, and others require the operator to press an INFO button to display text. A few car radios disable the RT readout when the car is moving.

DYNAMIC PS

When the CENELEC and NRSC standards for RDS/RBDS were initially drafted, scrolling text in the PS field was specifically forbidden. Despite this edict, not to mention the inferences of common sense, the refresh rate of the PS field makes message scrolling not only possible but also tempting. Early implementers of RDS discovered the means by which this could be done, and encoder manufacturers rose to the occasion with accommodating hardware. Now third-party 'data consolidators' provide message formatting services on a subscription basis to broadcasters, fitting messages into the 8-character PS field by calling on Internet connections and links to libraries of song titles, weather forecasts, stock quotes and sponsor's advertisements.

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'BLOCK' TRANSMISSION

The quickest and most popular PS messaging format is block transmission, which is supported and simplified by the SmartGen 4 'parsing' utility (see "PARSE" on page 39). Rather than scrolling the message across the receiver faceplate like so many marching soldiers, the message is formatted into 8-character blocks of text. Song title and artist information is sent on sequential 8-character screens like this:

```
  FIRST         CUT IS          THE
 DEEPEST       SHERYL          CROW
```

This gives the information in six screens. With a typical refresh rate of two seconds per screen, this same information could be repeated several times during the song, and even interspersed with a preview of the next selection, advertising, or a station ID and promo.

A message in the block format must be watched almost continuously to avoid missing part of the text. If the message can be counted on to repeat, a missed portion could be caught next time around. But if a lot of information is flying along at a good clip, the data-deprived driver could easily be distracted.

"SAFE SCROLLING"

In the interest of safety, Deva Broadcast developed an alternative technique that more closely fits the description of scrolling-PS, very much like soldiers marching past a reviewing stand. This alternative is not nearly as fast as the block transmission method, but is far safer. Here is how the same song and title would look:

FIRST C	FIRST CU	IRST CUT
RST CUT	ST CUT I	T CUT IS
CUT IS	CUT IS T	UT IS TH
T IS THE	IS THE	IS THE D
S THE DE	THE DEE	THE DEEP
HE DEEPE	E DEEPES	DEEPEST
DEEPEST	EEPEST C	EPEST CH
PEST CHE	EST CHER	ST CHERY
T CHERYL	CHERYL	CHERYL C
HERYL CR	ERYL CRO	RYL CROW

This safer method has taken 30 screens to show the same information that the block method displayed in 6 screens. That's a full minute versus 12 seconds by the block method. Clearly the throughput is far less with Safe Scrollilng, but the display requires only the occasional glance to capture the entire message. Safe Scrolling does not accommodate the 'channel surfer' well, as a scrolled message may not repeat if tuned-in in the middle of a song.

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SELECTING THE DYNAMIC MODE

To activate the block mode of dynamic PS messaging with automatic parsing, type: PARSE=0↵ . For the scrolling mode, type: PARSE=1↵ .

ENABLING DYNAMIC PS AND SETTING THE REFRESH RATE

The transmission rate for frames of PS data can be adjusted between a nominal 'fast' and 'slow'. For block text transmission, a slower setting would be a wise choice, as each block of the message would stay on the radio's 8-character display long enough to be seen by an occasional casual glance.

In the case of scrolling text, a faster setting would be in order, as the message inherently takes longer to display in its entirety.

To *enable* dynamic PS messaging, type: DPSS=n↵ , where n is a number between 1 and 9; 1 being the slowest update of the PS field, and 9 being the fastest. Type: DPSS=0↵ to turn dynamic PS messaging off. Entering a zero value will transmit the saved static message in the PS field.

Some radios are 'confused' by too frequent an update in the PS field. A fast setting for scrolling text could display only gibberish on some radios.

ENTERING DYNAMIC PS TEXT

Dynamic PS messages are held in encoder memory as 64-character (maximum) text strings. In the block mode, the parsing utility consolidates short words and 'sidesteps' longer ones to fit successive 8-character display screens. If the Safe Scrolling PS mode is used, the message will just slowly march across the radio display. It is only necessary to leave a few spaces at the end of a scrolling message so that the text can be read in its entirety before it is replaced with a new one.

For either display mode, simply enter text as all-caps by typing: DPS=x1x2x3 . . . x64↵ , x representing up to 64 capital characters.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}
F	I	S	R	T		C	U	T		I	S		T	H	E		D	E	E	P	E

x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	x_{36}	x_{37}	x_{38}	x_{39}	x_{40}	x_{41}	x_{42}	x_{43}	x_{44}
S	T		S	H	E	R	Y	L		C	R	O	W								

x_{45}	x_{46}	x_{47}	x_{48}	x_{49}	x_{50}	x_{51}	x_{52}	x_{53}	x_{54}	x_{55}	x_{56}	x_{57}	x_{58}	x_{59}	x_{60}	x_{61}	x_{62}	x_{63}	x_{64}

Using the automatic parsing utility (PARSE=0), text is entered without need for special formatting, perhaps just as it comes from station automation.

There is sufficient space available to add further information such as ON KWAV or A&M RECORDS. If no text is entered in the blank, trailing fields, the message will begin repeating from the beginning once the display clears by scrolling completely off-screen.

DON'T FORGET that all the static RDS registers, including simple scrolling messages, can be entered or changed easily through either the Windows® or network data entry screens.

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Tabulated Listing of
Encoder Commands and Prompts

PARAMETER	COMMAND	DATA ENTRY
Program Identification	PI=	4 digit HEX number (station "digital address")
Program Service Name	PS=	8 (max) ASCII characters (station "street name")
Dynamic PS	DPS=	64 (max) ASCII characters (for messaging in PS field)
Dynamic PS Speed	DPSS=	0 to 9 (0 = Off, 1 = slow, 9 = fastest)
Dynamic PS Method	PARSE=	0 through 9 (0 = parsed, centered; 1-8 Safe Scrolling; 9 = parsed, centered)
Program Type	PTY=	1 or 2 digit number (describes station format)
Traffic Program	TP=	0 or 1 (0 = no, 1 = yes)
Traffic Alert	TA=	0 or 1 (0 = flag off, 1 = flag on)
Software TA Timeout	TATIME=	0 to 9 (0 = function off, 1-9 = minutes to timeout)
Alternative Frequencies	AF1= AF2= AF3= AF4= AF5= AF6= AF7= AF8= AF9=	0 to 204 (0 = blank; 1 to 204 = "channel" in 100kHz increments, 87.6MHz to 107.9MHz)
Decoder Information	DI=	1 digit HEX number (defines mono or 2-channel mode)
M/S	MS=	0 or 1 (0 = speech-only, 1 = music)
RadioText	TEXT=	64 (max) ASCII characters
Dynamic RadioText Speed	DRTS=	0 to 9 (0 = Radiotext off; 1 to 9 = update rate, slow to fast)
RS-232 Serial Baud Rate	SPEED=	2400 or 4800 or 9600 or 19200 or 39400 or 57600 or 15200 baud
Command Echo	ECHO=	0 or 1 (0 = echo off, 1 = echo on)

COMMAND	SPECIAL COMMANDS
?	Followed by command without equal sign returns status of encoder memory for that parameter; e.g.: AF3?.
??	Returns all data in encoder memory.
REV	Returns firmware revision number.
SAVE	Saves all uploaded commands to non-volatile RAM.
RESET	Resets the encoder as if AC power were cycled off and on.
INIT	Initializes the encoder to all factory defaults.

RESPONSE	MEANING
OK	Command received by encoder properly formatted and understood.
NO	Command properly formatted but data not understood.
(NONE)	Data sent is ignored by the SmartGen 4.

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WARRANTY TERMS AND CONDITIONS

I. TERMS OF SALE: Deva Broadcast products are sold with an understanding of "full satisfaction"; that is, full credit or refund will be issued for products sold as new if returned to the point of purchase within 30 days following their receipt, provided that they are returned complete and in an "as received" condition.

II. CONDITIONS OF WARRANTY: The following terms apply unless amended in writing by Deva Broadcast Ltd.

A. The Warranty Registration Card supplied with this product must be completed and returned to Deva Broadcast within 10 days of delivery.

B. This Warranty applies only to products sold "as new." It is extended only to the original end-user and may not be transferred or assigned without prior written approval by Deva Broadcast.

C. This Warranty does not apply to damage caused by improper mains settings and/or power supply.

D. This Warranty does not apply to damage caused by misuse, abuse, accident or neglect. This Warranty is voided by unauthorized attempts at repair or modification, or if the serial identification label has been removed or altered.

III. TERMS OF WARRANTY: Deva Broadcast Ltd. products are warranted to be free from defects in materials and workmanship.

A. Any discrepancies noted within ONE YEAR of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at Deva Broadcast's option.

B. Parts and labor for factory repair required after the one-year Warranty period will be billed at prevailing prices and rates.

IV. RETURNING GOODS FOR FACTORY REPAIR:

A. Equipment will not be accepted for Warranty or other repair without a Return Authorization (RA) number issued by Deva Broadcast prior to its return. An RA number may be obtained by calling the factory. The number should be prominently marked on the outside of the shipping carton.

B. Equipment must be shipped prepaid to Deva Broadcast. Shipping charges will be reimbursed for valid Warranty claims. Damage sustained as a result of improper packing for return to the factory is not covered under terms of the Warranty and may occasion additional charges.

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PRODUCT REGISTRATION CARD

• All fields are required, or warranty registration is invalid and void

Your Company Name_____

Contact_____

Adress Line 1_____

Address Line 2_____

City_____

State/Province_____ ZIP/Postal Code_____

Country_____

E-mail_____ Phone_____ Fax_____

Which Deva Broadcast product did you purchase?_____

_____

_____

Product Serial #_____

Purchase date_____/_____/_____   Installation date_____/_____/_____

_____
Your signature*

*Signing this warranty registration form you are stating that all the information provided to Deva Broadcast are truth and correct. Deva Broadcast declines any responsibility for the provided information that could result in an immediate loss of warranty for the above specified product(s).

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