

## ENC-S40 Serial Encoder IC

### Introduction

The ENC-S40 is an 8-pin asynchronous serial encoder IC designed to work with the Holtek HT648L or HT658 decoder IC's.

### DIN

DIN is the serial data input pin. The data rate is fixed at 9600 baud N, 8, 1. Serial data input on DIN must be in TRUE mode where the idle (non transmit) period will hold the DIN input at logic 1. This allows the ENC-S40 to interface to the PC serial port through a MAX232 RS232/TTL converter IC, directly to microcontrollers such as the PIC, BASIC Stamp, 8051, and USB/Serial converter cables, IC's or modules that are compatible with 3VDC to 5VDC logic levels & TRUE asynchronous serial mode.

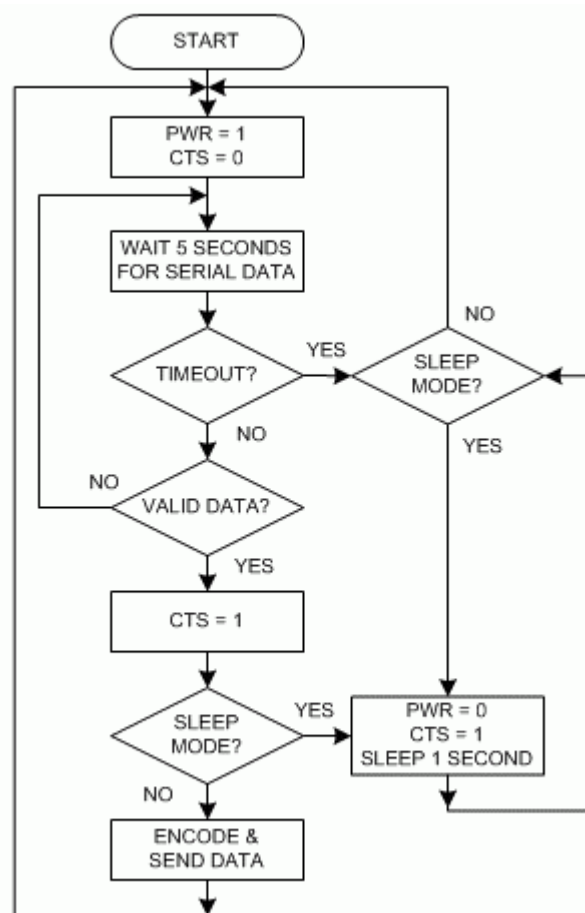


Figure 1: ENC-S40 Operational Flowchart

### DATA FORMAT

The ENC-S40 expects to receive 4 bytes in each serial data packet. The 1st byte is the ASCII capital letter A. The 2<sup>nd</sup> byte is the low byte of the 10-bit address. The 3<sup>rd</sup> byte contains the upper 2-bits of the 10-bit address. The 4<sup>th</sup> and final byte is the 8-bit data byte to place on the decoder data outputs.

The ASCII capital letter A is used for synchronization, and to mark the start of each data packet.

The following is a PicBasic Pro compiler code example for sending a data packet to the ENC-S40 using a Microchip PIC™ microcontroller.

## ENC-S40 Serial Encoder IC

```
ADD VAR WORD      ' Holds 10-bit address to send
DAT VAR BYTE      ' Holds 8-bit data byte to send
X VAR BYTE        ' Loop byte variable
ADD = 16          ' Set decoder address to 16. Address can be from 0 to 1023 for 10-bit.
SYMBOL CTS = PORTB.0 ' RB0 connects to ENC-S40 CTS output
```

Main:

```
DAT = %00000001
FOR X = 0 TO 7
  WHILE CTS = 1 ' Wait until CTS = 0 (clear to send) before sending data
  WEND
  SEROUT2 PORTB.0,84,["A",ADD.LowByte,ADD.HighByte,DAT]
  DAT = DAT << 1 ' Shift 1 bit from lsb to msb across decoder outputs
NEXT X
PAUSE 1000
GOTO Main
```

### DOUT

DOUT is the encoder data output pin. This pin connects directly to the RF transmitter data input pin or other transmission medium. The idle or non-transmit output logic of the DOUT pin is ground. Each encoded data packet consists of a synch period, 5 synch bits, followed by the 10-bit address, followed by 8-bits data. The time period for 1 encoded data transmission from start to finish is approximately 333mS as shown below in Figure 2. This simulates a Holtek HT640 8-bit encoder IC sending a total of 5 complete data packets.

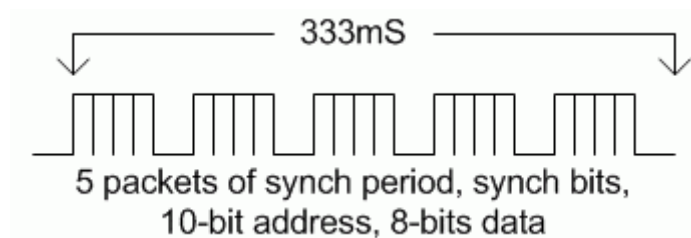


Figure 2: ENC-S40 Data Structure / Packet Timing

### VSEL

VSEL adjusts the encoded data signal timing to adjust for Holtek series HT648L & HT658 decoders operating at 3V or 5V DC with a 390K-oscillator resistor.

- ❑ **VSEL = Vcc**: Holtek HT648L or HT658 operating at 5V with 390K-oscillator resistor.
- ❑ **VSEL = 0**: Holtek HT648L or HT658 operating at 3V with 390K-oscillator resistor.

Note that all data timing is based on the Holtek 8-bit decoder using a 390K-oscillator resistor. Using an oscillator resistor other than 390K with the Holtek HT468L or HT658, or voltage levels other than 3V or 5V DC will not guarantee the ENC-S40 will work with the Holtek decoder. All timing is based on these parameters.

### SLEEP

The SLEEP input pin is used to place the ENC-S40 into low-power sleep mode for minimum current consumption when pulled to ground. Typical current draw in sleep mode is 30uA @5V, and 18uA @3V assuming no external loads are being driven by output pins CTS or PWR. In sleep mode, the CTS output pin is held at Vcc. The PWR output pin is held at ground.

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### **Using SLEEP Mode**

With the DIN pin held at Vcc, and no serial data or noise is seen on DIN within 5 seconds, the ENC-S40 will automatically time-out, test the SLEEP input pin, and enter sleep mode if requested, or immediately return to the serial input routine waiting for data.

If the application requires entering sleep mode immediately, then it's necessary to send 1 complete data packet to the ENC-S40. Immediately after receiving a valid data packet the ENC-S40 will test the sleep input pin, and go into low-power sleep mode if the SLEEP input pin is at logic 0. The data packet received just prior to entering sleep mode will be discarded. If the SLEEP input pin is at logic 1 when data is received, data will be encoded and sent. See the flowchart in Figure 1 for details.

### **CTS**

The CTS or "Clear To Send" pin is used for hardware handshaking between the ENC-S40 & device sending asynchronous serial data to the ENC-S40 encoder.

- CTS = 0:** The ENC-S40 is ready to receive serial data.
- CTS = Vcc:** The ENC-S40 is busy encoding data, sending data, or in SLEEP mode.

The external device sending data to the ENC-S40 simply tests the logic output of the CTS pin to determine whether the ENC-S40 is ready for new data or busy. Serial data should be sent to the ENC-S40 only when the CTS pin is at logic 0. All data sent while CTS is at logic 1 will be lost.

### **PWR**

The PWR pin may be used to control power to the RF transmitter. During normal operation the PWR pin will provide Vcc to the transmitter. In sleep mode it will output ground to power-down the transmitter. If not used to control power to the transmitter, this pin may be used for any purpose such as to controlling an LED or other logic device. The PWR pin can sink or source up to 25mA max. To control a device requiring more than 25mA with the PWR pin, a secondary driver such as an NPN transistor should be used.. The ENC-S40 example applications schematic provides several examples for using the PWR output.

### **Specifications:**

**ENC-S40 IC:** Microchip PIC12F683 PIC™ Microcontroller

**Power Requirements:** Well Regulated 3 to 5 VDC

**DOUT Max Output Current:** Sink or Source 25mA

**PWR Max Output Current:** Sink or Source 25mA

**CTS Max Output Current:** Sink or Source 25mA

**DIN Input Data Rate/Format:** Fixed at 9600 bps N, 8, 1. TRUE mode, line idles at logic 1.

**Idle/Transmit Current:** ~2mA @5 VDC

**Sleep Current:** ~30uA @5V, ~18uA @3v

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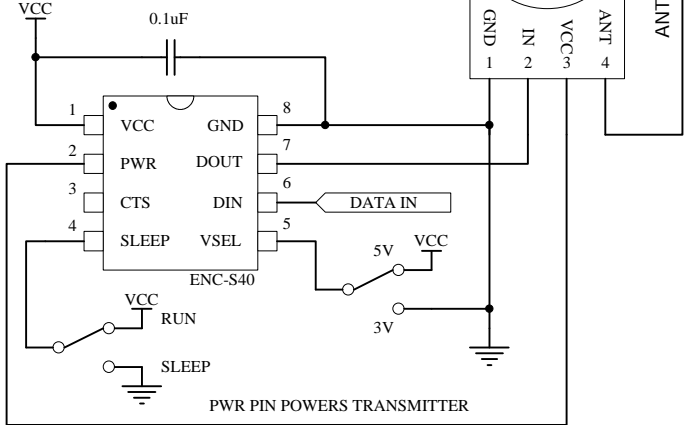
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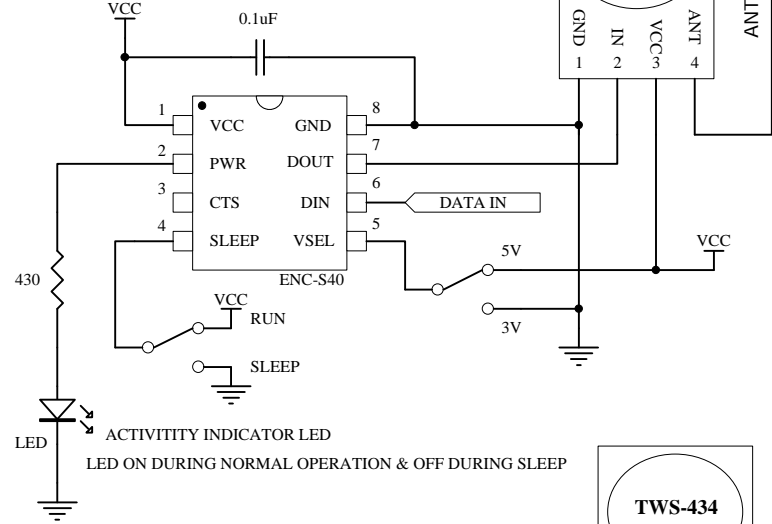
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SAMPLE APPLICATION CIRCUITS FOR USING THE ENC-S40 8-PIN ENCODER IC  
WITH THE TWS-434A RF TRANSMITTER

USING ENC-S40 PWR OUTPUT TO POWER TRANSMITTER

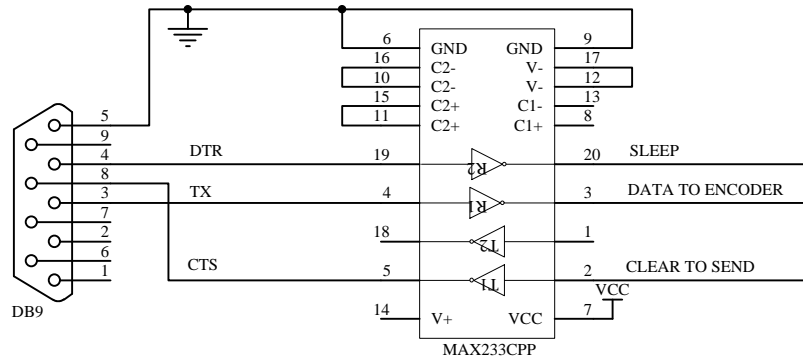


PWR PIN POWERS TRANSMITTER



ACTIVITY INDICATOR LED  
LED ON DURING NORMAL OPERATION & OFF DURING SLEEP

EXAMPLE USING THE ENC-S40 WITH PWR OUTPUT TO POWER TRANSMITTER & PC INTERFACE WITH HARDWARE HANDSHAKING ON CTS



PC ASSERTS DTR TO PLACE ENCODER IN SLEEP MODE  
ENCODER CTS OUTPUT PIN SIGNALS PC WHEN CLEAR TO SEND DATA

NOTE: SWITCHES ON VSEL AND SLEEP INPUTS ARE OPTIONAL. THESE PINS MAY BE HARD-WIRED TO VCC OR GROUND OR CONTROLLED DIRECTLY BY A MICROCONTROLLER OR OTHER TTL COMPATIBLE LOGIC DEVICE

[http://www.rentron.com/remote\\_control/ENC-S40.htm](http://www.rentron.com/remote_control/ENC-S40.htm)

Title			EXAMPLE CIRCUITS USING THE ENC-S40 ENCODER IC WITH TWS-434A		
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