Quadravox

Playback Modules: QV306M4-P and QV306M4

QV306m4-P: pre-programmed RS232 playback module for ISD4003-4MP series ChipCorders™

The QV306m4-P module is functionally identical to the QV306m4 module (see data sheet for QV306m4). The only difference between the two modules is that QV306m4-P comes pre-programmed with 240 professionally recorded words and phrases. It can be used "directly out of the box" for numerous "playback only" applications, such as:

- Talking clock
- Talking calendar
- Talking thermometer
- Talking calculator
- Talking speller
- Talking instruments
- .....

The complete list of pre-programmed words and phrases is given in the annex to this document. The vocabulary list is arranged in such an order as to make algorithmic access easier to certain parts of the list. For example, all number words are arranged in order at the beginning of the list. The days of the weeks, months, letters and military alphabet letters are also sequentially organized. Most of the rest of the vocabulary is arranged in alphabetical order.

A sample Basic Stamp II™ application is supplied, to illustrate the interface between QV306m4-P and a popular software development system. This basic program contains several subroutines to:

✓ Speak a number from 0 to 65535
✓ Say a date between 1/1/1900 and 12/31/2099
✓ Say the time of day
✓ Change the output volume
✓ Get the module's revision number and type

Since the QV306m4-P is functionally identical to the QV306m4, it can be reprogrammed using a Quadravox QV430P programmer, if the vocabulary is not suitable for a certain application.

QV306m4 RS232 playback module for ISD33000-4000 series ChipCorders®

Features:

- delivered with 4 minute ISD4003-04
- up to 240 messages
- three addressing modes
- low power dissipation: <2mA at 5V, less than 1uA in power down mode
- single 5V supply (3V is generated on-board)
- separate amplifier power control and busy functions
- digitally controlled analog volume control
- 300mW amplifier on-board, compatible with QVamp3 12W amplifier module
- built-in sequential record mode for initial ChipCorder® setup
- automatic sensing of number of phrases when used with our recording software
- free recording software from our website
- PC interface hardware available, or build your own from our schematics
- for use with simple RXD/TXD RS232 controls

General description:

The QV306m4 module provides a simple method of adding voice and sound to your system. It comprises a controller based on a Microchip PIC processor, an ISD4003-04 ChipCorder® analog recording chips with four minutes capacity at 4kHz bandwidth, a digital potentiometer for volume control, and a 300mW audio amplifier. A line level, volume controlled output is also available. It is controlled with a simple two-wire RS232 connection (the return path is optional). Baud rate is selectable.

By taking advantage of the ChipCorder's® cueing mode, the QV306 can manage up to 240 separate messages without explicit reference to physical addresses. Three phrase selection modes are provided and are selected via a mode setting command. The addressing mode can be changed at any time.

A single n,8,1 byte transfer selects one of 240 messages (subject to the constraints explained later in this document). A code of 0fxh is interpreted as a mode- or volume- set command. A byte in the range 0-239 selects a single message in direct addressing mode, or determines the upper bound of a linear sequence or random selection. Upon power up or after a recording, the system will automatically detect the number of messages and define its own maximum upper bound.

The ChipCorder® and amplifier are powered only during operations. The QV306 is powered from start-up until the sleep mode bit is set with a set mode command. The mute/power pin can be used to switch power to an external amplifier. RESET_ wakes the QV306 from sleep mode.

Simple programming tools for creating properly formatted ISD ChipCorders® are available in software and schematic form free from <www.quadravox.com>. These tools eliminate the need to purchase a sound development system. If required, the Quadravox QV401P gang programmer can be used to mass produce formatted ChipCorder® devices.

In order to make the module as small as possible, the RS232 level conversion, audio connectors, power jack and 5V regulator are on a separate PCB, the QV430P. The QV430P makes it convenient to use our free QV300S2 programming software, but it not required for operation.

QV306m4 pin out and control lines:

Control lines	**pin**	**level**	**Function**
RXD (5V)	**1**	**--**	RS232 receive line
TXD (5V)	**2**	**--**	RS232 transmit line
BUSY_	**3**	**low**	indicates system is busy
BR1	**4**	**--**	msb of baud rate selection; must be +5V or GND
BR0	**5**	**--**	lsb of baud rate selection; must be +5V or GND
RECLED_	**6**	**low**	can be used to sink current for record LED. The external system must provide the current-limiting resistor.
+5V	**7**	**+5**	system power
GND	**8**	**0**	system ground
ANA_IN	**9**	**--**	line level analog input for recording
ANA_OUT	**10**	**--**	line level, volume controlled, analog output
GND	**11**	**0**	system ground
PWR_	**12**	**low**	can be used to control an external power amplifier such as the QVamp3.
AUX	**13**	**--**	not used in this version.
RESET_	**14**	**low**	system reset
SP-	**15**	**--**	speaker output; bridge tied load
SP+	**16**	**--**	speaker output; bridge tied load

Baud rate selection:

BR1	BR0	Rate
0	0	2400b
0	1	4800b
1	0	9600b
1	1	19200b

Commands:

Value	Record mode?	Action
0-239	No	Play phrase <value> according to mode settings
240-255	No	Set mode: see mode table for functions
1	Yes	Start recording individual phrase
0	Yes	Stop recording individual phrase

Set mode functions:

Value (hex)	Function
0f0h	set play mode to direct addressing
0f1h	set play mode to linear sequence
0f3h	set play mode to random sequence
0f4h	record mode; subsequent 1 and 0 commands start and stop recording
0f6h	stop play
0f8h	sleep
0fch	set volume with next byte transmitted. Only values 0-31 are valid
0fdh	software reset
0feh	return version byte (00ch)
0ffh	return type byte (036h)

Setting the addressing mode:

The QV306m4 offers three modes of playback addressing. The modes are selected using the two low-order bits of the set mode command. Bit 0 selects direct or sequential addressing. In direct addressing (bit 0 = 0), the value transferred in the command byte is used to select the phrase of the same number. If a value exceeding the maximum number of recorded phrases is sent, the last phrase in the memory will be played. If bit 0 is set to one, the phrase played will lie within the bounds of zero and the number transferred in the command byte. If bit 1 of the mode value is 0, the phrases in this range will be played in sequence, rolling back to zero after the top phrase (the one corresponding to the command byte) has been played. If bit 1 is 1, a randomly-selected one of the same range will be played.

The mode can be changed at any time, so system operation can combine the different addressing options. For example, to have ten phrases triggered by specific events and a different set of ten randomly selected by a fifth event, do the following:

- Record the phrases in order with the ten randomly selected ones as the first ten in the list.
- To randomly select one of the bottom group, first issue a set mode command specifying “random sequence” (0f3h). Repeatedly sending a command byte of “9” will produce a random selection of phrases 0-9.
- To select one of the fixed phrases, issue a set mode command for “direct” (0f0h), the send the number of the phrase to be played.
- If you desire that the phrases in the first group be played in sequence, issue a set mode “linear sequence” (0f1h) instead of 0f3h.

Recording messages:

The primary function of the QV306m4 is to manage message playback. The recording function is intended to be used only to set up the system initially. Messages must be recorded in the order they are to be selected, that is, from number 0 to n, and must all be recorded in the same session. Resetting record mode places a very short file on the ChipCorder to serve as the “last” marker. Quadravox provides the QV300S2 software and optional QV430P hardware to perform this operation, but it is simple enough to be easily integrated into your application.

To record a new set of messages:

- issue a set mode “record” command (0f4h)
- send a command byte of “1” (01h) and at the same time start applying the analog signal to be recorded to the analog-in+ pin of module. The recording level may have to be adjusted to achieve the best overall recording quality, as explained in ISD’s documentation.
- When the analog segment is complete, send a command byte of “0” to stop the recording and place an EOM marker in the ChipCorder.
- When all phrases have been recorded, issue a set mode command of 0f0h.(or 0f1h or 0f3h for different playback modes)

Playing messages:

To play a message, first ensure that the mode (as explained as above) matches your intentions. Then, issue a single byte in a contiguous range from 0 to the number of recorded messages – 1 (maximum 239). When the phrase has completed, a byte with the number of the phrase spoken will be returned.

Message play can be stopped by issuing a stop command (0f6h). There is no return code for a stop command. Be aware that the ISD ChipCorder may require up to 50ms to effect the stop after it is received. Commands sent during this time may fail to execute properly.

The BUSY_ line can also be used to determine when the message is complete.

Power management:
The QV306m4 sends a power up command to the ChipCorder on startup. The QV306 and the ChipCorder will remain powered up until a set mode "sleep" command is issued. The amplifier will be muted or powered down except during playback. This muting is essential to cover address scan noise. The PWR_ pin can be used for the same function with an external amplifier. The system can be awakened by use of the RESET_ pin.

Applications:

The QV306m4 is intended for message playback applications where the user requires the large capacity of ISD's serial interface ChipCorders®, but does not want to develop custom microprocessor algorithms to manage the devices.
The QV306m4 can also be used in conjunction with a host microprocessor in lieu of developing custom real-time code on the host platform. When used in cueing mode, the ISD chips in this series require either constant polling or an interrupt driven service routine for advancing to the proper address. If used in address mode, they require that the microprocessor maintain an address table with entries for each of the independently accessed phrases. The QV306m4 can offload these functions as well as system power management from the main processor.

Limitations:

The QV306m4 is limited to 240 phrase selections.

The minimum allowable phrase length is 200ms, which in practical terms means that the minimum valid phrase length is more than a single segment for most ISD part types. This restriction is due to the necessity of using a particularly short phrase as an end-of-project marker.

The QV306m4 uses ISD's cueing mode for message management. Playback starting delay depends on both the position of the data in the chip and the number of messages in the project. Although the cueing mode scan runs 1600 time faster than normal chip speed, this still can amount to 150ms for a four-minute chip. To this is added the overhead of restarting the scan after each message is located. This delay complicates use of the 306 for phrase concatenation, but with care in the data preparation, some limited use is possible. Place all the frequently concatenated sounds (e.g. numbers) at the beginning of the list, followed by ending phrase segments, and finally by beginning phrase sections. This will optimize the allocation of the unavoidable delays

Simple development platform:

The QV300S2 software and QV430P programming hardware provide a low-cost method of programming the 306m4 modules. The QV300S2 software is available free from the Quadravox website. The software makes use of your PC's sound card and serial port to control the QV306m4, which in turn invokes a cueing-mode record routine. The connections are as follows:

Serial port pins:
Ground (DB9 pin 5) connects to system ground.
TXD (DB9 pin 2) connects via the MAX232 level converter to QV305 RXD.
RXD (DB9 pin 3) connects via the MAX232 level converter to QV305 TXD.
Sound card line out, left channel, is capacitively coupled to one of the analog-in pins of the ISD chip.

Electrical Characteristics:

Absolute Maximum Ratings:

Stresses above these limits may cause permanent damage to the PIC16C505 controller device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may effect device reliability.

Ambient temperature under bias	-40°C to +125°C
Storage temperature	-65°C to +150°C
Voltage on VDD with respect to Vss	0 to +7 V
Voltage on all other pins with respect to Vss	-0.6 v to (VDD + 0.6V)
Total power dissipation	700 mW
Maximum current out of Vss pin	150 mA
Maximum current into VDD pin	125 mA
Input clamp current, IIK (VI < 0 or VI >VDD)	+/- 20 mA
Output clamp current, IOK (Vo < 0 or Vo >VDD)	+/- 20 mA
Maximum output current sunk by any output pin	25 mA
Maximum output current sourced by any input pin	25 mA

DC Characteristics: standard operating temperature 0°C ≤ TA ≤ +70°C

Power supply pins:

Symbol	Description	Min	Typ[1]	Max	Uni	Conditions
VDD	**Supply voltage**	3.5		5.5	V	
VPOR	**VDD start voltage to ensure power-on reset**	--	Vss	--	V	See section on power-on reset for details
SVDD	**VDD rise rate to ensure power-on reset**	0.05	--	--	V	See section on power-on reset for details
IDD	**Supply current[2]**	--	1.8	2.4	mA	VDD = 5.0V
IPD	**Power down current**	--	4	12	µA	VDD = 3.5V
VIL	**Input low voltage** RXD, BR0-1-	Vss	--	0.5	V	
VIH	**Input high voltage** RXD, BR0-1	2.0	--	VDD	V	4.5 ≤ VDD ≤ 5.5V
IIL	**Input leakage current[2]** RXD, BR0-1	--	--	+/- 1	µA	Vss ≤ VPIN ≤ VDD
VOL	**Output low voltage** RECLED_, TXD	--	--	0.6	V	IOL=8.5mA, IDD=4.5V
VOH	**Output high voltage** RECLED_, TXD	VDD-0.7	--	--	V	
CIO	**Capacitive loading specs on output pins**	--	--	50	pF	

Note 1: Data in the typical ("typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

2: Negative current is defined as coming out of the pin

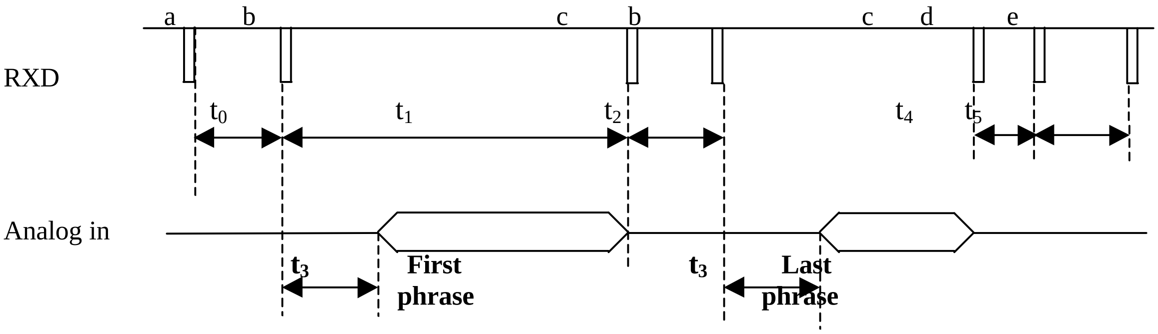
AC Characteristics: standard operating temperature 0°C $\leq$ TA $\leq$ +70°C

Symbol	Description	Min	Typ[1]	Max	Unit	Conditions
TioR	**Pin output rise time**	--	10	25[2]	ns	
TioF	**Pin output fall time**	--	10	25[2]	ns	

Note 1: Data in the typical ("typ") column is based on characterization results at 5V, 25°C. These parameters are for design guidance only and are not tested.

2: These parameters are design targets and are not tested. No Characterization data available.

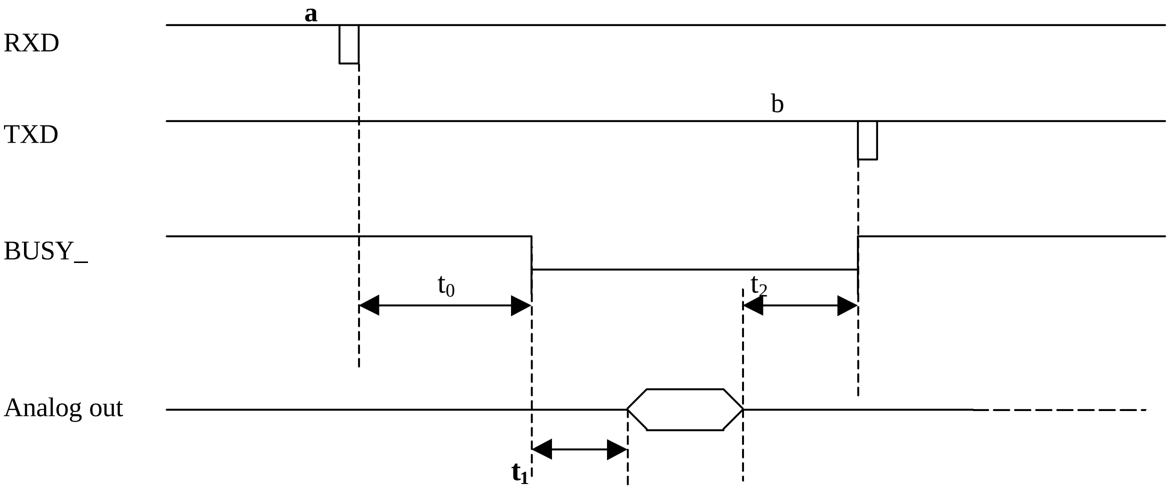
Record timing:



Timing values:

Symbol	event	min	typ	max	unit
t0	record mode start to first recording start	200			ms
t1	recording length	200		chip-400	ms
t2	spacing between subsequent recordings	50			ms
t3	start recording to analog in	15			ms
t4	end of last recording to end of recording mode	50			ms
t5	end of recording mode to next command	500			ms
a	set recording mode (F4h)				
b	start recording command (01h)				
c	stop recording command (00h)				
d	clear recording mode (F0h)				
e	any other command				

Play Timing:

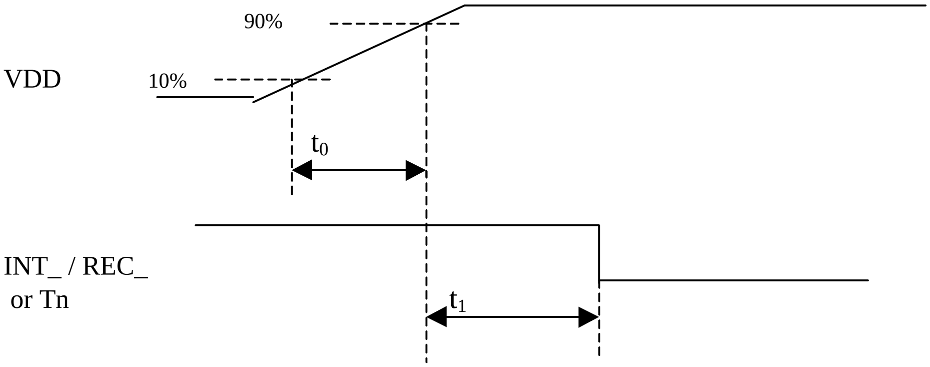


Timing values:

Symbol	event	min	typ	max	unit
t0	play command to BUSY_ active		10		us
t1	BUSY_ active to audio output		15	*	ms
t2	end of sound to BUSY_ inactive		1		ms
a	play command (00h – Efh)				
b	“done” response from QV306m4 (word value)				

*Note: the delay depends on the position of the data in the ISD chip and the number of messages in the project. For the ISD4003-04 and 20 messages, the maximum possible delay is approximately 150ms.

Power up timing:



Timing values:

Symbol	Event	min	typ	max	unit
t0	Vcc rise time			9	ms
t1	Delay to first command	500			ms

Online Support:

Quadravox maintains the latest specifications, schematic diagrams, and support software in the support section of our website, www.quadravox.com/support.htm.

For questions not answered there or for other inquiries, please write us at support@quadravox.com, or call 1-800-779-1909 from the U.S. and Canada, or 1-972-669-4002 from other countries.

Annex 1: Vocabulary list

zero
one
two
three
four
five
six
seven
eight
nine
ten
eleven
twelve
thirteen
fourteen
fifteen
sixteen
seventeen
eighteen
nineteen
twenty
thirty
forty
fifty
sixty
seventy
eighty
ninety
hundred
thousand
million
billion
two thousand
a.m.
p.m.
a
alpha
b
bravo
c
Charlie
d
delta
e
echo
f
fox
g
golf
h
hotel
i
India
j
Juliet
k
kilo
m
mike
n
november0
o
Oscar
p
papa
q
Quebec
r
Romeo
s
sierra
t
tango
u
uniform
v
victor
w
whiskey
x
Xray
y
Yankee
z
Zulu
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
January
February
March
April
May
June
July
August
September
October
November
December
amp
amps
Bars
bit
bits
black
blue
brown
byte
bytes
cable
Celsius
centimeter
centimeters
Cents
chip
Cubic
degrees
divided by
Dollars
down
equals
Fahrenheit
farads
feet
foot
Gallons
gigahertz
go
gold
good afternoon
good morning
goodbye
gram
grams
gray
green
hello
hertz
hour
hours
inch
inches
indoor temperature
is
key
kilobit
kilobits
kilobyte
kilohm
kilometer
kilometers
kiloohms
light
Liters
mega
megabytes
megaohms
megohms
meter
meters
micro
micron
microns
midnight
mile
miles
milli
minus
minute
minutes
noon
o clock
Of mercury
Of water
ohms
orange
Pascals
per hour
per
percent
pico
pink
plus
point
pound
pounds
p.s.i
purple
r.p.m
red
second
seconds
silver
square
start
stop
switch
tan
temperature is
the current time is
the current
the outside
the speed is
the
thee
times
up

volt
volts
white
wire
yard
yards
yellow
your speed is
the date
is more
please wait
please
is less
thank you
than
and
are closed
are down
are off
are on
are open
are up
is closed
is down
is off
is up
is open

Annex 2: Basic Stamp 2 sample program

```
' Quadravox Talking Module for Basic Stamp 2 (QV306M4-P)
'
'=============================================
'QV306M4-P pinout and control lines:
'
'Control lines   pin     level   Function
'RXD (5V)                1       --              RS232 receive line
'TXD (5V)                2       --              RS232 transmit line
'BUSY_           3       low             indicates system is busy
'BR1                     4       --              msb of baud rate selection; must be +5V or GND
'BR0                     5       --              lsb of baud rate selection; must be +5V or GND
'RECLED_                 6       low             can be used to sink current for record LED. The
external
'                                                system must provide the current-limiting resistor.
'+5V                     7       +5              system power
'GND                     8       0               system ground
'ANA_IN                  9       --              line level analog input for recording
'ANA_OUT                 10      --              line level, volume controlled, analog output
'GND                     11      0               system ground
'PWR_                    12      low             can be used to control an external power amplifier
such
'                                                as the QVamp3.
'AUX                     13      --              not used in this version.
'RESET_                  14      low             system reset
'SP-                     15      --              speaker output; bridge tied load
'SP+                     16      --              speaker output; bridge tied load
'Baud rate selection:
'BR1 BR0 Rate
'0 0 2400b               'this is the one implemented here
'0 1 4800b
'1 0 9600b
'1 1 19200b
'Commands:
'Value           Action
'------------------------
'0-239           Play phrase <value> according to mode settings
'240-255                 Set mode: see mode table below for functions
'
'Set mode functions:
'Value (hex)     Function
'------------------------
'0f0h            set play mode to direct addressing
'0f6h            stop play
'0f8h            sleep
'0fch            set volume with next byte transmitted. Only values 0-31 are valid
'0fdh            software reset
'0feh            return version byte (00dh)
'0ffh            return type byte (036h)
'------------------------
'
' Board of Education Connections
'
'  We call Q1, Q2, ... pins 1,2 ... of the QV306M4-P module:
```

```
'
' 1) Insert the QV306M4-P module at the far end of the Board of Education, component side
'           facing away from the Basic Stamp 2. Align the left most pin (Q16) of the connector with
'           the left most row of the board (P15). This way, Pin 1 (Q1) of QV306M4-P corresponds to the row
'           of P1 for the Basic Stamp.
' 2) Wire connections:
'           On the QV306M4-P side of the "Board of Education":
'           - VDD to Q7 (QV306M4-P Pin 7: Power)
'           - VSS (Ground) to Q8  (QV306M4-P  Pin 8: Ground) . Then from there to Q5 (QV306M4-P pin 5:
BR0) and Q4 (QV306M4-P  Pin 4: BR1)
'                                 (to set the baudrate at 2400 bps)
'           - connect a wire to Q15 and one Q14: these two wires will go to an 8 Ohm speaker
'
'           From the Px connections, on the Stamp side:
'
'           -P1 to Q1 on the QV306M4-P side (QV306M4-P receive)
'           -P2 to Q2 on the QV306M4-P side (QV306M4-P transmit)
'           -P3 to Q3 on the QV306M4-P side (QV306M4-P busy_)
'           -P14 to Q14 on the QV306M4-P side (QV306M4-P  reset)
'
'                     Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q
'                     1 1 1 1 1 1 1 9 8 7 6 5 4 3 2 1
'                     6 5 4 3 2 1 0
'       ============================================= QV306M4-P
'                     . . . . . . . . . . . . . . . . .
'           V         . . . . . . . . . . . . . . . .
'           S         . . . . . . . . . . . . . . . .
'           S         . . . . . . . . . . . . . . . .
'                     . . . . . . . . . . . . . . . . .
'
'
'                     . . . . . . . . . . . . . . . . .
'           V         . . . . . . . . . . . . . . . .
'           D         . . . . . . . . . . . . . . . . .
'           D         . . . . . . . . . . . . . . . . .
'                     . . . . . . . . . . . . . . . . .
'
'                     = = = = = = = = = = = = = = = = =
'                     P P P P P P P P P P P P P P P P
'                     1 1 1 1 1 1 9 8 7 6 5 4 3 2 1 0
'                     5 4 3 2 2 0
'
'
'
'                      _________________
'           | Basic Stamp 2 |
'                      -----------------
'
'
'
'
' Vocabulary list
'
NUM0            con       0
NUM1            con       1
NUM2            con       2
```

```
NUM3            con     3
NUM4            con     4
NUM5            con     5
NUM6            con     6
NUM7            con     7
NUM8            con     8
NUM9            con     9
NUM10           con     10
NUM11           con     11
NUM12           con     12
NUM13           con     13
NUM14           con     14
NUM15           con     15
NUM16           con     16
NUM17           con     17
NUM18           con     18
NUM19           con     19
NUM20           con     20
NUM30           con     21
NUM40           con     22
NUM50           con     23
NUM60           con     24
NUM70           con     25
NUM80           con     26
NUM90           con     27
NUM100          con     28
NUM1000         con     29
million         con     30
billion  con     31
NUM2000         con     32
a_m             con     33
p_m             con     34
let_a           con     35      'this is the letter "a"
alpha           con     36
let_b           con     37
bravo           con     38
let_c           con     39
charlie  con     40
let_d           con     41
delta           con     42
let_e           con     43
echo            con     44
let_f           con     45
fox             con     46
let_g           con     47
golf            con     48
let_h           con     49
hotel           con     50
let_i           con     51
india           con     52
let_j           con     53
juliet   con     54
let_k           con     55
kilo            con     56
let_m           con     57
mike            con     58
```

```
let_n               con       59
november0           con       60
let_o               con       61
oscar               con       62
let_p               con       63
papa                con       64
let_q               con       65
quebec    con        66
let_r               con       67
romeo               con       68
let_s               con       69
sierra    con        70
let_t               con       71
tango               con       72
let_u               con       73
uniform   con        74
let_v               con       75
victor    con        76
let_w               con       77
whiskey   con        78
let_x               con       79
xray                con       80
let_y               con       81
yankee    con        82
let_z               con       83
zulu                con       84
monday    con        85
tuesday   con        86
wednesday           con       87
thursday  con        88
friday    con        89
saturday  con        90
sunday    con        91
january   con        92
february  con        93
march               con       94
april               con       95
may                 con       96
june                con       97
july                con       98
august    con        99
september           con       100
october   con       101
november            con       102
december            con       103
amp                 con       104
amps                con       105
Bars                con       106
bit_w               con       107       'this is the word "bit"
bits                con       108
black               con       109
blue                con       110
brown               con       111
byte_w    con       112       'this is the word "byte"
bytes               con       113
cable               con       114
```

```
celsius   con       115
centimeter          con       116
centimeters         con       117
Cents               con       118
chip                con       119
connector           con       120
Cubic               con       121
degrees   con       122
divided_by          con       123
Dollars   con       124
down                con       125
equals    con       126
fahrenheit          con       127
farads    con       128
feet                con       129
foot                con       130
Gallons   con       131
gigahertz           con       132
go                  con       133
gold                con       134
good_aftcon         135       'good afternoon'
good_morn           con       136       'good morning'
goodbye con         137
gram                con       138
grams               con       139
gray                con       140
green               con       141
hello               con       142
hertz               con       143
hour                con       144
hours               con       145
inch                con       146
inches    con       147
indoor_temp         con       148       'indoor temperature'
is                  con       149
key                 con       150
kilobit   con       151
kilobits  con       152
kilobyte con        153
kilohm    con       154
kilometer           con       155
kilometers          con       156
kiloohms            con       157
light               con       158
Liters    con       159
mega                con       160
megabytes           con       161
megaohms            con       162
megohms             con       163
meter               con       164
meters    con       165
micro               con       166
micron    con       167
microns con         168
midnight            con       169
mile                con       170
```

```
miles               con       171
milli               con       172
minus               con       173
minute    con       174
minutes   con       175
noon                con       176
o_clock   con       177
Ofmerc    con       178
Ofwater   con       179
ohms                con       180
orange    con       181
Pascals   con       182
per_hour            con       183
per                 con       184
percent   con       185
pico                con       186
pink                con       187
plus                con       188
point               con       189
pound               con       190
pounds    con       191
Psi                 con       192
purple    con       193
r_p_m               con       194
red                 con       195
second    con       196
seconds   con       197
silver    con       198
Square    con       199
start               con       200
stop_w    con       201       'this is the word "stop"
switch    con       202
tan                 con       203
temp_is   con       204       'temperature is'
t_curr_t_is         con       205       'the current time is'
the_current         con       206
the_outside         con       207
t_speed_is          con       208       'the speed is'
the                 con       209
thee                con       210
times               con       211
up                  con       212
volt                con       213
volts               con       214
white               con       215
wire                con       216
yard                con       217
yards               con       218
yellow    con       219
y_speed_is          con       220       'your speed is'
the_date  con       221
is_more   con       222
please_wait         con       223
please    con       224
is_less   con       225
thank_you           con       226
```

```
than            con     227
and_w           con     228     'this is the word "and"
are_closed      con     229
are_down        con     230
are_off  con    231
are_on   con    232
are_open        con     233
are_up   con    234
is_closed       con     235
is_down  con    236
is_off   con    237
is_up           con     238
is_open  con    239
'
' Aliases for I/O definitions
'
RECEIVE_LINE    con     1
TRANSMIT_LINE           con     2
NBAUD2400               con 396
'============================================
' I/O Definitions
'NBAUD2400
out14  = 0
output   14     'reset line
input    3      'busy line
out1     = 1                    'WARNING if RECEIVE_LINE is not 1, this line must be changed accordingly!!!!
output   RECEIVE_LINE 'receive
input    TRANSMIT_LINE          'transmit
'============================================
' Aliases for QV commands
'
QV_DIRECT       con     $F0
QV_STOP         con     $F6
QV_SLEEP        con     $F8
QV_VOLUME       con     $FC
QV_RESET        con     $FD
QV_REVISION     con     $FE
QV_TYPE         con     $FF
'============================================
' variables for say_number program
'
znumber         var     word
zdigit   var    word
ztmp            var     word
ztmp1           var     word
'
' variable for say_date program
'
zcentury var    bit     ' 0 for 19xx, 1 for 20xx
zyear           var     byte    ' number from 0 to 99
zmonth   var    nib     ' 1 for January, 2 for February, etc...
zday            var     byte    ' day of the month: 1 through 31
zdayweek        var     nib     ' day of the week: 1 for Monday, 2 for Tuesday,...
'
' variables for say_time program
```

```
'
zam_pm var      bit       ' 0 for a.m. 1 for p.m.
zhour           var       nib       ' hour from 1 to 12
zmin            var       byte      ' minute: from 0 to 59
'==========================================
' Program start
'==========================================
gosub DoReset    'Reset the QV Module
'-------
' Test say_number
'-------
znumber =65530 'change value of number here to hear other numbers
gosub say_number  'module says" sixy five thousand five hundred thirty"
pause 2000
'-------
gosub getQvRevision
'debug HEX? ztmp          'uncomment this line to see Revision Number in Debug Window
gosub getQvType
'debug HEX? ztmp          'uncomment this line to see Type Number in Debug Window
'-------
ztmp=1
loopVolume:
if ztmp> 31 then endLoopVolume
gosub QVSetVolume
serout RECEIVE_LINE,NBAUD2400,[switch]       ' Module says "switch" 32 times from lowest to
highest volume
gosub WaitNotBusy
ztmp =ztmp + 1
goto loopVolume
endLoopVolume:
'-------
' Test say_date
'-------
zcentury=1
zyear =1
zmonth=1
zday=19
zdayweek=5
'
' the date defined here is Friday ,January 19, 2001
'
gosub say_date    'Module says "Friday ,January 19, 2001"
pause 2000
'-------
' Test say_time
'-------
zhour=11
zmin = 52
zam_pm= 1
'
' the time defined here is 11:00 pm
'
gosub say_time    'Module says" the current time is eleven fifty two, p.m."

end_program:      'Program stops here
end
```

```
'
'
'
'***************
' subroutines  *
'***************
say_number:
'
' subroutine to speak the number contained in the variable znumber
' the maximum  value of this variable is 65535
'
            ztmp = znumber
            if ztmp >0 then strictly_pos
            serout RECEIVE_LINE,NBAUD2400,[num0]
            gosub WaitNotBusy
            return
strictly_pos:
            zdigit = ztmp /1000
            if(zdigit = 0) then next_test100
            gosub say_2dnumber
            serout RECEIVE_LINE,NBAUD2400,[NUM1000]    'say "thousand"
            gosub WaitNotBusy
next_test100:
            ztmp=ztmp - (zdigit * 1000)
            zdigit =ztmp /100' the hundreds
            if zdigit = 0 then next_test_10
            serout RECEIVE_LINE,NBAUD2400,[zdigit]
            gosub WaitNotBusy
            serout RECEIVE_LINE,NBAUD2400,[NUM100]     'say "hundred"
            gosub WaitNotBusy
next_test_10:
            zdigit = ztmp - (zdigit * 100)
            gosub say_2dnumber         'only a 2 digit number left
            return
'**********
say_2dnumber
'
' subroutine to speak a non zero 2 digit number contained in zdigit
'
            if zdigit >20 then more_than_20
            if zdigit =0 then ret_say_2dnumber
            serout RECEIVE_LINE,NBAUD2400,[zdigit]
            gosub WaitNotBusy
            return
more_than_20:
            ztmp1= zdigit / 10             'tens
            serout RECEIVE_LINE,NBAUD2400,[ztmp1 +num18]
            gosub WaitNotBusy
            ztmp1 = zdigit - (ztmp1 * 10)
            if(ztmp1 = 0) then ret_say_2dnumber
            serout RECEIVE_LINE,NBAUD2400,[ztmp1]
            gosub WaitNotBusy
ret_say_2dnumber:
            return
'**********
say_date:
            if zdayweek > 7 then skip_day_week
            serout RECEIVE_LINE,NBAUD2400,[monday + zdayweek -1]
            gosub WaitNotBusy
skip_day_week
            if zmonth > 12 then skip_month
            serout RECEIVE_LINE,NBAUD2400,[January + zmonth -1]
            gosub WaitNotBusy
skip_month:
            if(zday > 31) then skip_day
            if( zday =0) then skip_day
skip_day:
            zdigit=zday
            gosub say_2dnumber
if(zcentury = 1) then say_2000
            serout RECEIVE_LINE,NBAUD2400,[NUM19]
            gosub WaitNotBusy
            goto say_year_digits
say_2000:
            serout RECEIVE_LINE,NBAUD2400,[NUM2000]
            gosub WaitNotBusy

say_year_digits:
            if(zyear =0) then skip_year
            zdigit=zyear
            gosub say_2dnumber
skip_year:
return

'**********
say_time:
'
' subroutine to say time in 12 hour format (plus a.m. or p.m)
'
' the hour is contained in variable zhour (1-12)
' the minutes are in variable zmin (0-59)
' the variable zam_pm (1 bit) contains a.m. (0) or p.m. (1)
'
if(zhour =0) then skip_time           'hour invalid, don't talk
if(zhour > 12) then skip_time         'hour invalid, don't talk
if(zmin > 59) then skip_time          'minutes invalid, don't talk
serout RECEIVE_LINE,NBAUD2400,[t_curr_t_is]   'say: the current time is
gosub WaitNotBusy
zdigit=zhour
gosub say_2dnumber
zdigit=zmin
'
' several cases
'
if(zmin=0) then say_am_pm             ' don't say "zero" for minutes
if(zmin>=10) then say_minutes
say_oh:
'
' here, single digit minutes, we say "oh" first
'
serout RECEIVE_LINE,NBAUD2400,[let_o]
gosub WaitNotBusy
```

```
say_minutes:
gosub say_2dnumber
say_am_pm:
if(zam_pm =0) then say_am
say_pm:
        serout RECEIVE_LINE,NBAUD2400,[p_m]
        gosub WaitNotBusy
        goto skip_time
say_am:
        serout RECEIVE_LINE,NBAUD2400,[a_m]
        gosub WaitNotBusy
        goto skip_time
skip_time:
return
'**********
WaitNotBusy:
'
' wait till the QV Module is finished talking
' at which point IN3 = 1
'
hold:   if IN3 = 0 then hold
        return
'**********
DoReset:
out14 = 0       'do a reset
pause 100       '
out14 = 1
pause 2000      'wait while the QV module counts its phrases
return
'**********
GetQVRevision:
'
' queries revision number of QV Module
' stores it in variable ztmp
'
serout RECEIVE_LINE,NBAUD2400,[QV_REVISION]
serin TRANSMIT_LINE,NBAUD2400,[ztmp]
return
'**********
GetQVType:
'
' queries type of QV Module
' stores it in variable ztmp
'
serout RECEIVE_LINE,NBAUD2400,[QV_TYPE]
serin TRANSMIT_LINE,NBAUD2400,[ztmp]
return
'**********
QVSetVolume:
'
' sets volume of QV module with value (0--31) stored in ztmp
'
if ztmp <32 then volume_OK
ztmp=31
volume_OK
serout RECEIVE_LINE,NBAUD2400,[QV_VOLUME]
serout RECEIVE_LINE,NBAUD2400,[ztmp]
return
```