

# μSmartDigi™

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by

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# μSmartDigi™

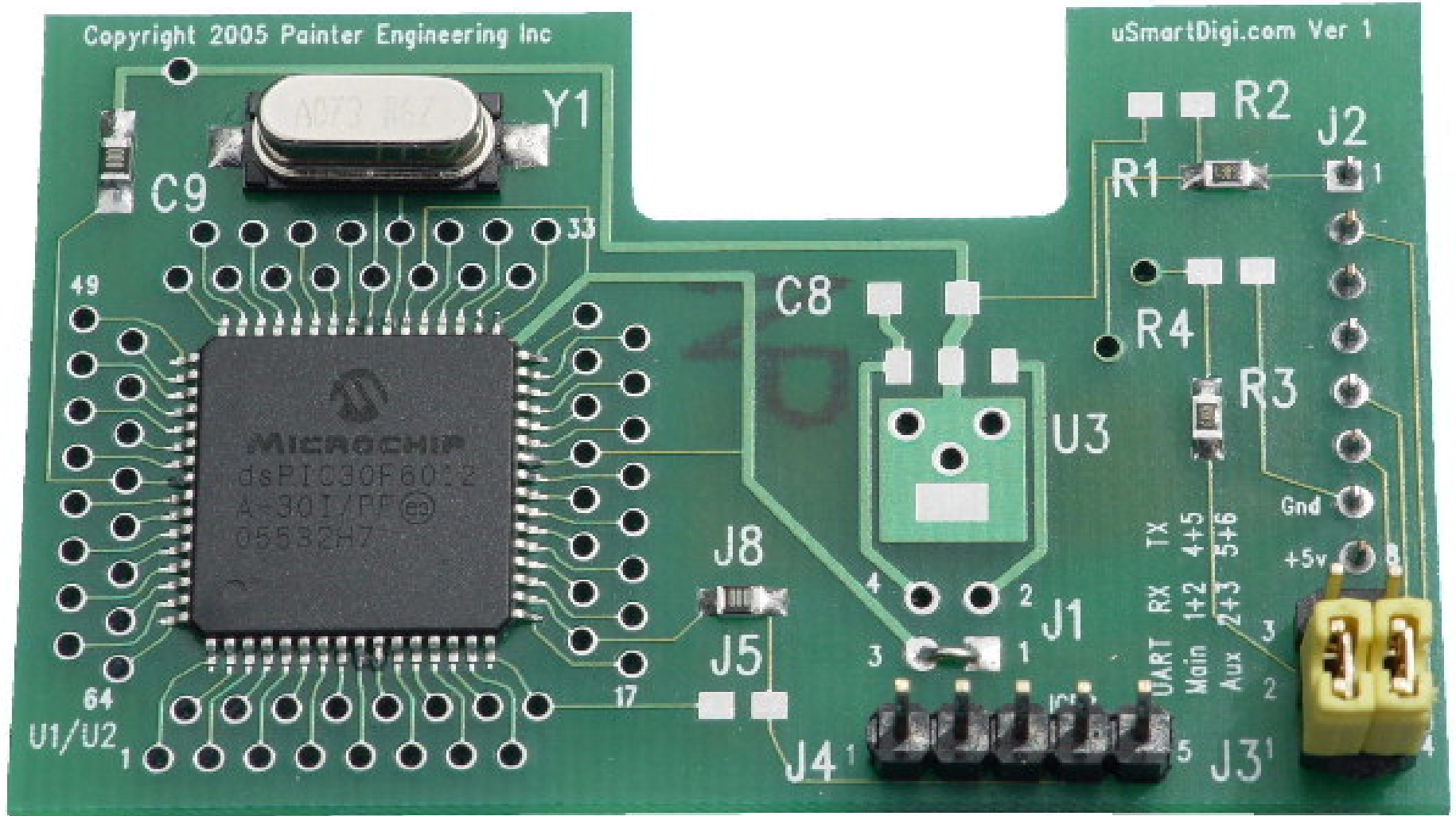
◆ μSmartDigi™ APRS® Digipeater

◆ μSmartDigi™ D-Gate D-STAR Gateway

◆ μSmartDigi™ Packet Digi ???

# μSmartDigi™ Basics

- ◆ 1.5in x 2.5in PCB Expansion Board for Coastal ChipWorks TNC-X
- ◆ CPU is Microchip's dsPIC 30F/33FJ DSP Microcontroller Family
- ◆ 30+ MIPS
- ◆ Powered at 8-16 VDC, 60-200 mA
- ◆ Programmed in native C





# **μSmartDigi™** Common Features

- ◆ Operates without dedicated PC/Laptop
- ◆ Firmware is Field Flashable without special hardware
- ◆ Configuration and Rules stored in EEPROM
- ◆ Interactive Monitor for Configuration changes and Message Logging

# **μSmartDigi™** Common Features

## ◆ PC/Laptop Utility

- Processes Configuration and Rules from ASCII text files
- Performs extensive error checking
- Downloads Configuration and Rules into EEPROM
- Flashes Firmware distributed in Intel Hex format (standard for Microchip)

# **μSmartDigi™** Common Features

## ◆ PC/Laptop Utility cont.

- Communicates with **μSmartDigi™** over RS-232 or TNC-X Optional USB Module

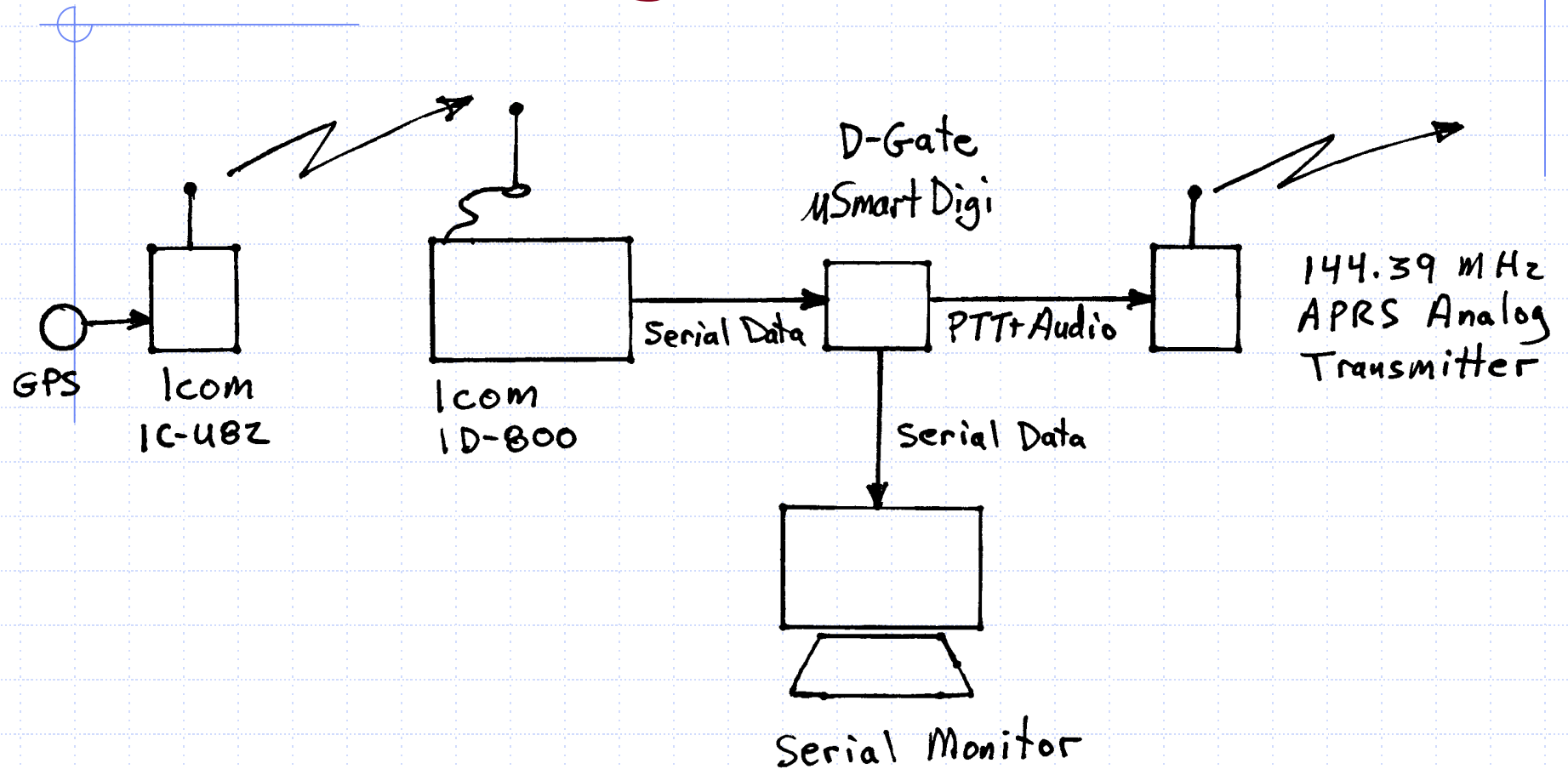
## ◆ Use PC/Laptop Terminal Emulator, etc. to Monitor Logged Messages, directly enter Configuration Parameters (but not Rules)



**μSmartDigi™**

# D-Gate Features, Use & Configuration

# µSmartDigi™ D-Gate Features



# µSmartDigi™ D-Gate Features

- ◆ Gates D-STAR Digital Messages to APRS® RF Network
- ◆ Requires specific D-STAR D-PRS Message Format
- ◆ Message Format Calculator at <http://www.aprs-is.net/dprscalculator.htm> courtesy of Pete Loveall, AE5PL

# µSmartDigi™ D-Gate Features

- ◆ Eliminates duplicates based on Call Sign within 10-second window
- ◆ Eliminates duplicate messages within a configurable 28-second window (classic dupe checking)
- ◆ Filters messages according to set of User-defined Rules

# **µSmartDigi™** D-Gate Features

- ◆ Converts D-STAR NMEA GPS data to Base-91 compressed Position Reports
- ◆ Converts Symbol and Text Data

D-STAR:

```
$GPRMC,013318,V,2756.4589,N,08227.2434,W,0.0,0.0,010306  
,4.5,W,S*1B  
AB0VO 9,BD D-GATE TEST*71
```

DROP: Line 8, Rule 1:

```
AB0VO-9>APRS,WIDE1*,WIDE2-2 <UI Len=34>:  
!/@Bb%9\S]#! @BD D-GATE TEST
```

# µSmartDigi™ D-Gate Features

- ◆ Supports D-STAR GPS and GPS-A modes for Icom's IC-2820 (ver 2.2)

```
$$CRCCE3E,AE5PL-T>API282,DSTAR*:!3302.39N/09644.66W>/
```

```
$$CRC986F,WD5ERDHT>API282,DSTAR*:!3302.39N/09644.66W>/
```

# μSmartDigi™

## D-Gate Use & Configuration Live Demo

- ◆ Config File
- ◆ Rules File
- ◆ Downloading
- ◆ Flashing Firmware
- ◆ Monitor Commands

**μSmartDigi™**

# APRS Digi Features, Use & Configuration



# µSmartDigi™ Digi Features

- ◆ Configured with fixed Lat-Lon or use real-time updates from attached GPS
- ◆ Supports a combo of GPS and Log Monitoring on single serial port
- ◆ Log output is UI-View style

```
DROP: Path Rules: Bad Digi: -0 and H=0  
KD6FVP-2>APS224,N6EX-1,WIDE1 <UI Len=45>:  
>152343z[224]*We know most of your faults!!!
```

```
DROP: Path Rules: Digi1 RELAY  
N6XQY-12>GPSLJ,RELAY,WIDE2-2 <UI Len=71>:  
$GPRMC,013641.06,A,3348.1607,N,11807.4631,W,34.0,090.5,231105,13.,E*73
```

# µSmartDigi™ Digi Features

- ◆ Packet-Checking Algorithm
  - Uses short-circuit logic
  - 1. Verify Digipeater Path
  - 2. Perform Duplicate Check
  - 3. Decode Position Information
  - 4. Process against User-defined Rules

# µSmartDigi™ Digi Features

- ◆ Verify Digipeater Path
  - Checks for Generic Path (dst field)
  - Checks for exhaustion
  - Optionally scans for RELAY
  - Ignores TRACE
  - Applies hop-count limits (Max, Total)  
eg. WIDE1-1,WIDE4-4

# μSmartDigi™ Digi Features



## Beaconing

- Specify default digi Path
- Specify interval in seconds
- Specify comment string
- Specify Icon and Overlay (ver 2.5)

# **μSmartDigi™** Digi Features

- ◆ Perform Duplicate Check
  - Fields src, src ssid, dst, info
  - Uses Fast CCITT CRC16 1021 Normal Table-based algorithm
  - User-defined time window (default 28 seconds)

# µSmartDigi™ Digi Features

## ◆ Decode Position Information

- Raw NMEA Messages
  - ◆ GGA
  - ◆ RMC
- MIC-E
- Base-91 Compression

# µSmartDigi™ Digi Features

## ◆ Position Information Currently Supported

- \$ (GGA and RMC only)
- !=
- /@
- ` \

# µSmartDigi™ Digi Features

- ◆ Process against User-defined Rules
  - Implicit and Explicit Rules
  - Short-circuit logic
  - Specify *PASS* or *DROP*
  - Match src or dst fields with optional wild character (\*)
  - Geoposition based on *compass* direction, *circle*, *sector* (pie segment) or *rectangle*



# µSmartDigi™ Digi Features

- ◆ Process against User-defined Rules
  - Lat, Lon and Angles are specified in several flexible formats
    - ◆ Colon: [s]DDD:MM:SS[.F\*]  
-38:33:29.222 45:18:
    - ◆ Dotted: [s]DDD.MM.[F\*]  
-103.00. -38.33.379
    - ◆ DMC (Degrees Minutes seconds):  
N 39d 23.7m, 33.9c, W104d40m8.4c, -42.5d

# µSmartDigi™ Digi Features

- ◆ Process against User-defined Rules
  - Rules are edited in an ASCII file
  - No special editor
  - Files are portable
  - PC/Laptop Utility reads, error checks, compiles into compressed internal format and downloads into EEPROM

# µSmartDigi™ Digi Features



## Example Rules

```
implicit      pass
drop src ab0vo
pass dst APU25N
pass circle 2.5    n 39d 31m,      W 104.669d      // hole
drop cir      50.5  n 39d 31m,      w 104.669d      // donut
drop compass W    39:31:00, w 104.669d  # drops West
drop rect     40d 0m .5c, -104d 30m, 39d, -103d /* box
drop sect     32d, 60d, 5           // drops all packets 5 miles or
                                     // greater from the repeater
                                     // from 32deg from N to 60deg
                                     // from North
```

# **μSmartDigi™** Digi Features

- ◆ Configuration Parameters
  - Parameters are edited in an ASCII file or interactively into the **μSmartDigi™**
  - No special editor
  - Files are portable
  - PC/Laptop Utility reads, error checks and complies into compressed internal format and downloads into EEPROM

# **µSmartDigi™** Digi Features

## Configuration Parameters (subset)

<code>call</code>	<code>CALL</code>
<code>ssid</code>	<code>SSID</code>
<code>position</code>	<code>Lat Lon</code>
<code>havegps</code>	<code>y   n</code>
<code>digipath</code>	<code>&lt;comma-separated path&gt;</code>
<code>host</code>	<code>[baud]</code>
<code>tnc</code>	<code>[baud]</code>
<code>gps</code>	<code>[baud]</code>
<code>beacon</code>	<code>seconds</code>
<code>relaydrop</code>	<code>y   n</code>
<code>widemax</code>	<code>N</code>
<code>widetotal</code>	<code>N</code>
<code>dupewin</code>	<code>seconds</code>

# μSmartDigi™

## Digi Use & Configuration Live Demo

- ◆ Config File
- ◆ Rules File
- ◆ Downloading
- ◆ Flashing Firmware
- ◆ Monitor Commands
- ◆ GPS attachment

# μSmartDigi™ Summary

◆ Q&A

◆ Web Sites

<http://usmartdigi.com>

<http://www.tnc-x.com>

<http://www.aprs-is.net/dprscalculator.htm>

<http://www.icomamerica.com/amateur/d-star/dstar2.asp>

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