THE WEST RAND AMATEUR RADIO CLUB

February 2004
Volume 4, Issue 7

ANODE

Inside this issue:

Editor's Comments

Pc terms are NOT Pc!

L.A. officials have asked pc manufacturers to stop using "Master" and "Slave" terms when describing IDE connected hard drives. They say that the labels could be "construed as offensive or defamatory in nature".

AO-40 SUFFERS CATASTROPHIC POWER FAILURE

The main battery pack on board the AMSAT Oscar 40 satellite has failed and controllers are unsure if the bird can be brought back to life on the reserve power system. Amateur Radio Newsline's Norm Seeley, KI7UP, tells us what happened on-orbit:

According to AMSAT Executive Vice President Rick Hambly, W2GPS, AO-40 began its tumble to obscurity on Sunday, January 25th. That's when the satellites battery voltage momentarily dropped to 24 point 5 volts. This triggered a fail-safe that shut down the satellites pass bands. Then, at the beginning of the eclipse on orbit 1486 the battery voltage rapidly dropped just below the cut-off voltage of 24.0 volts and this shut down the transmitters to protect the battery and other on board equipment.

AMSAT controllers kept a close eye on the bird and on Tuesday the 27th the battery voltage suddenly dropped from to 14V. Mission commanders currently believe that more battery cells

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A TWO-CHIP I/O EXPANDER FOR IBM PC PARALLEL PRINTER PORT

Francis J. Deck
fdeck@grumpy.helios.nd.edu

Special points of interest:

- Contact details on back page
- Boot Sale on the 6th of March. See page 2 for details

INTRODUCTION

A two-chip circuit which connects to the parallel printer port of an IBM PC or compatible computer provides 16 TTL-compatible i/o lines which are programmable in 4 groups of 4 bits. A short program in Turbo Pascal is given as an example of how to program the interface. The circuit can be expanded at the cost of one additional chip per 16 i/o bits. Total cost for the circuit is well under $10, using mail-order components.

CIRCUIT DESCRIPTION

Refer to the schematic diagram. Four Data lines from the parallel printer port are fed through a 74LS126 tri-state buffer. The outputs of the '126 are fed back into four Status inputs on the printer port. The Output Enable (OE) lines of the '126 are controlled by the PC, and the result is a 4-bit bi-directional "bus" which is shown as a double vertical bar.

The 8243 is a specialized circuit which is part of the 8048 micro controller family, and is intended for expanding the i/o ports of

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Editor's Comments

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short circuited. Control stations immediately began transmitting blind commands to the spacecraft in an attempt to switch over to the auxiliary battery. Eventually, the auxiliary battery pack came on line, but in parallel with the main pack. This means that the shorted main Ni-Cad battery is loading down the back-up Nickel Metal Hydride cells are clamping the voltage low and keeping the auxiliary battery from fully powering the spacecraft.

AMSAT is hopeful that one of the cells in the main battery will eventually fail open circuit. This would effectively remove the damaged battery from service and permit the back up battery to assume the full load of AO-40. In the meantime its a waiting game with fingers crossed that no other catastrophic failures to other parts of the satellite take place.

For the Amateur Radio Newsline, I'm Norm Seeley, KI7UP, in Scottsdale Arizona.

A set of spare A0-40 back-up batteries were found at the AMSAT lab in Orlando Florida. Using them Stan Wood, WA4NFY and Lou Mc Fadin, W5DID performed a series of tests that showed the auxiliary battery pack on board the satellite should work well if they are otherwise undamaged. Unfortunately, than will only happen if the main battery pack can be pulled off line.

Kantronics Kam TNC

I am interested in finding out what upgrades were/are available for the KAM. I am well aware of Kantronics' arrogant position of not supporting the hardware anymore which is part of my station.

Version history is available fm Kantronics at this web address:

http://www.kantronics.com/ver_hist.htm
73
Richard WB8KRN

From: "Hamhtr" <hamhtr@aol.com
Subject: Re: KAM TNC
Date: 2004-01-09 19:24

Hams abandoned Kantronics long before Kantronics abandoned the hams. Cheap hams decided that sound card software was better than a box, and that caused so many company's, like AEA, to go out of business.

You'll never see another ham based TNC, since hams think that poorly written soundcard software that is free is better than an external box with it's own processing.

Morons.

From: "Joseph Fenn" <jfenn@lava.net
Subject: Re: KAM TNC
Date: 2004-01-09 21:22

Ref TNC's vs Soundcard stuff.
Many seem to have forgotten that none of the soundcard stuff is actually CRC (cyclic redundancy Checksum).

Or "ARQ" automatic error correction. This is a prime necessity for digital msg traffic. So a msg originated by someone can be guaranteed it will arrive at destination error free no matter how many gateways or bbs it passes through enroute to destination.
Joe/ABM6JF/KH6JF

Boot Sale
There will be another West Rand Club boot sale on the 6th of March. The gates will be opened at 12:00. Vendors please do NOT park in front of the gates. Please park next to the fence adjacent to the gates. If you block the road again, we will not be able to hold any future boot sales. The residents of Kroton street were not amused by the long queue of cars blocking their driveways last boot sale.

I am looking forward to the boot sale as I have acquired a lot more pc 'junk' recently. See you there.

73 JB

PS [IRISH]
[If you didn't get this Anode, maybe you should have told the chairman your new email address. Or maybe you should have paid your subs?]

A TWO-CHIP I/O EXPANDER FOR IBM PC PARALLEL PRINTER PORT

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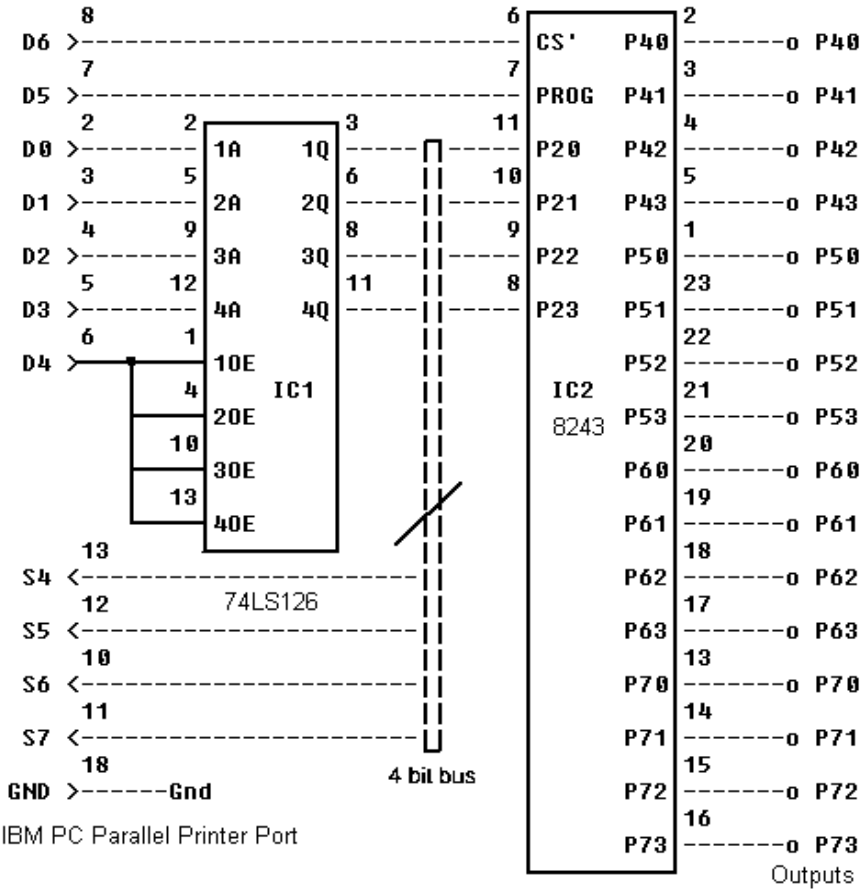
the 8048/49. It connects to the 4-bit bus, and has 4 4-bit i/o ports. It is controlled by a Chip Select (CS') line and a Program (PROG) line.

To execute an 8243 operation, the PC places a 4-bit "instruction" on the bus, with the PROG line HIGH, and then pulls the PROG line LOW. If a "write" instruction is requested, the data to be written is placed on the bus, and the PROG line returned to a HIGH state. If a "read" instruction is requested, the 8243 places the input data on the bus. The driver software anticipates this, and disables the outputs of the '126, so that data can flow from the 8243 back into the PC via the Status inputs.

None of this happens if the CS' line is HIGH, so multiple 8243s can share the same 4-bit bus, as long as the PC can control the CS' line of each 8243 separately. Although not shown in the schematic or implemented in the software listing, an additional 16 i/o bits can be implemented by adding a second 8243, whose CS' line is controlled by D7 (pin 9) from the PC.

Note:
The four ports are identified as P4 through P7, so that, e.g. P41 corresponds to bit 1 of port P4.



INTEGRATED CIRCUITS AND POWER CONNECTIONS

#	Type	+5	Gnd
IC1	74LS126	14	7
IC2	8243	24	12

SOFTWARE LISTING

```
{-------- 8243 i/o expander controller --------}

program e8243;

const
     cs = 64; {8243 chip select}
     prog = 32; {8243 program line}
     oe = 16; {74LS126 output enable}
     p4 = 0;
     {identifier corresponding to hardware port P4}
     p5 = 1; {and so on}
```

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DDS "Daughtercard"

Taken from NJQRP's Web site

DDS Daughtercard Kit Direct Digital Synthesis on a 1" x 2" pluggable card

Build this simple, small AD9850-based DDS board and plug it into your favourite project to serve as a precise and stable signal source from the sub-Hertz basement all the way up to 30 MHz.

The DDS Daughtercard is shown assembled. Photo on left shows top side with DDS, surface mount components for the LPF and MMIC output amplifier. Photo on right shows bottom side with the 100 MHz oscillator module, a 5V regulator and filter components. Note the production-quality soldermask and silkscreening of part outlines and legends. Additionally, jumper options make it possible to stack boards to utilize the dual output capability of the AD9850 DDS chip. As any homebrewer worth his/her salt can tell you, the Direct Digital Synthesis (DDS) chip captures the imagination and excitement like no other technology these days. Signal precision, accuracy, stability, programmability and RF output quality are all easily and inexpensively within one's grasp. But two quite formidable problems still remain.

The first is that these surface mount chips are so tiny, with lead pitches as fine a 0.65mm, that it's nearly impossible to homebrew with them using conventional techniques. Have you ever tried tack soldering a fine wire onto one of these small SOIC package leads? Even soldering the chip onto a blank pc board that fans out the leads is going to take some precision soldering and a magnifying lens on your workshop lamp, and you end up with two layers of boards with this approach.

The second problem is that these DDS chips must be interfaced to a micro controller of some sort for that frequency programmability. There are many projects around that control a DDS chip with a PIC, an Atmel controller, a BASIC Stamp, an SX chip, etc. I don't know about you, but the VFO I will ultimately need is likely to use a controller that I don't technically "know" and cannot program. This makes it tough to use the controller for anything but the DDS, thus raising the cost of the entire project, increasing the amount of board real estate needed and raising the power needs for the entire project.

Solution

We've created a small pc board containing just the bare DDS essentials – an Analog Devices AD9850 DDS chip, a 100 MHz clock oscillator, a 5th order elliptic filter, and a MMIC RF amplifier to boost the raw 200 mV p-p DDS signal to a more usable 1-volt level. The three control lines, power supply inputs, and the output signal are available on a pinheader at the board edge. The simple schematic is shown below.

The 8-position pinheader at the board edge serves to allow DDS Daughtercard to be plugged into whatever project you might have on your bench, regardless of which microcontroller is being used. Thus you are not locked into using an Atmel device if your preferred controller is a PIC. Just provide a single strip socket (e.g., a 16-pin IC

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DDS "Daughtercard"

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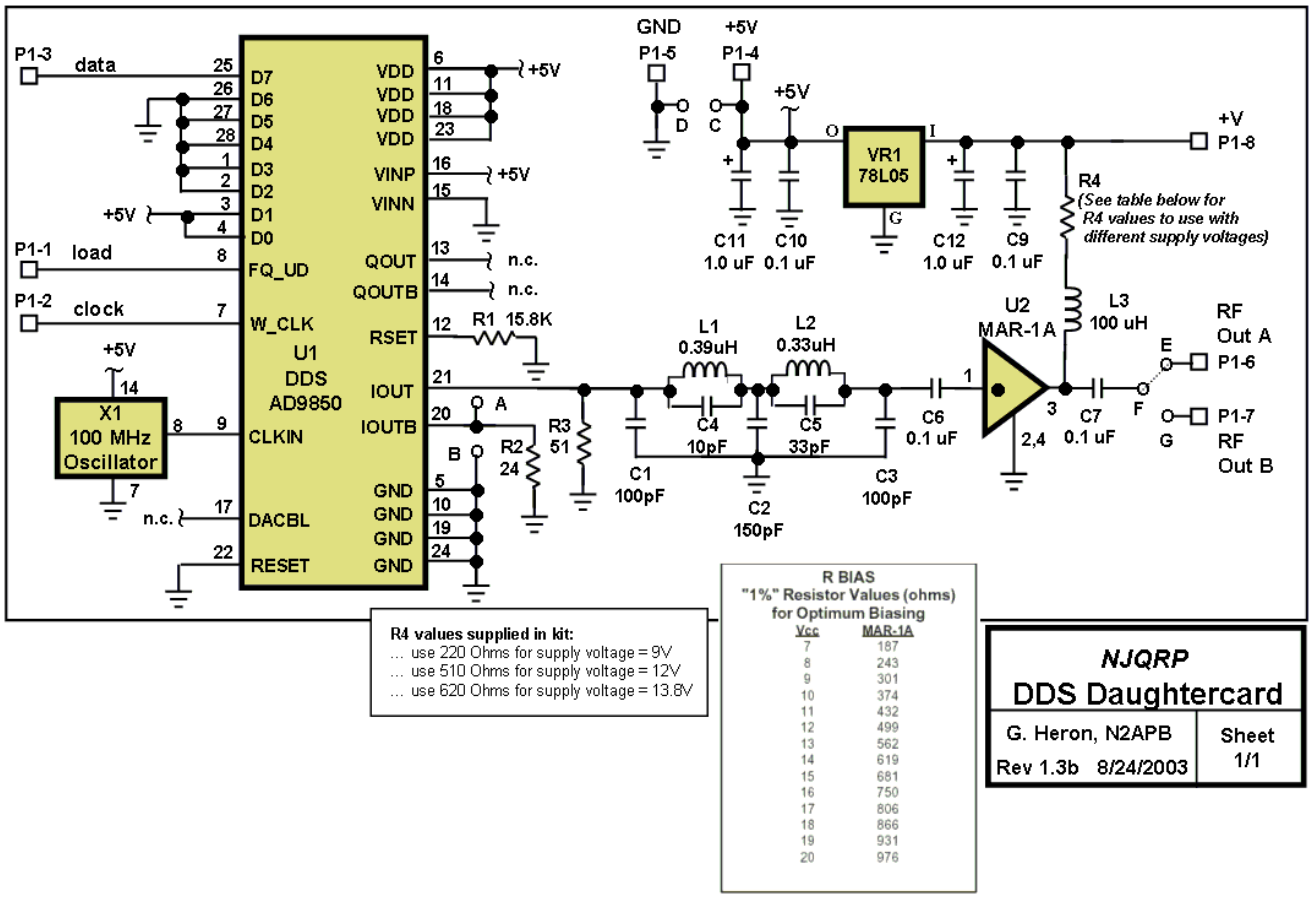
socket split lengthwise) on the project board and plug in the DDS pc board. Heck, you don't even need a microcontroller with this approach – just wire the pinheader signals over to a cable on the parallel printer port of your PC and use public domain PC software to control the DDS board!

appears on the output of the DDS board at pin 8.

The programming sequence can be easily accomplished. Joe Everhart, N2CX uses the following three lines to instruct a BASIC Stamp to produce a 7.040 MHz signal with the DDS Daughtercard on the Quickie-Lab...

ers to easily take advantage of the positive attributes of the DDS chip to produce high-quality homebrew variable-frequency signals.

Schematic for the DDS Daughtercard, rev 1.3 (View or download a hi-res PDF version)



The controller's software just needs to send a 40-bit serial data stream on the DATA line with each bit being clocked by the CLK control line. At the end of the sequence, the LOAD line is toggled to instruct the DDS chip to use the new frequency – then bingo, the new frequency

shiftout 7,8,0,[$02,$BC,$05,$12, $00] 'shift out 40-bit value on port P7 using P8 as clock out9 = 1 'toggle the line out9 = 0 'going to the DDS load pin

This simple DDS daughtercard project solves both of the problems cited at the top of this page, and enables homebrew-

An interesting option -- "Dual VFO"

The "daughter card's" pc board was designed to present an interesting option for the homebrewer. The AD9850 DDS chip offers a complementary output at IoutB (U1

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DDS "Daughtercard"

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pin 20), which is sometimes uses to feed the low pass filter along with the primary output signal IoutA to produce an output signal of even greater spectral purity. (Refer to the AD9850 data sheets for these details.) However, this secondary signal is not quite 180-degrees out of phase from the primary but one may experiment and possibly find useful applications for it using this capability. If this IoutB signal is to be used, a low pass filter must also be used to clean up its output ... and that's where the DDS Daughtercard's design options come into play.

If you wish to use the complementary IoutB signal, you can populate a second Daughtercard pc board with only the LPF and MAR-1 amplifier components and mount it over the main 'card. You can electrically interconnect these stacked 'cards by jumpering pads of each at locations A, B, C, D and G. That is, solder a short stiff wire from pad A of the lower board to pad A of the upper board, and so on. The A and B jumpers bring the IoutB signal and ground up from the primary 'card so it can be injected to the LPF and amp on the secondary 'card. On the top (secondary) 'card, connect point A to the LPF input, and connect jumper E-G to bring the signal down to pin P1-7 on the pin header. Thus, one is able to get two filtered and amplified complementary signals at the same connector from the same DDS chip!

So, what can you do with a "daughter card"?

There are many ways for you to use the DDS "daughter card". Essentially, all you need to do is combine it with your favorite microcontroller project to form a high-quality VFO. Click here to see lots of ideas!

Getting a FREE DDS chip from Analog Devices

The AD9850BRS DDS chip is not provided in the DDS Daughtercard Kit because homebrewers can obtain a free sample from the Analog Devices website at http://products.analog.com/products/info.asp?product=AD9850. Just go to this Internet location, register with Analog Devices (i.e., give them your mailing address), and within a week or so you will receive a free sample of the DDS chip by mail.

Need help attaching the DDS surface mount chip?

If desired, the NJQRP has lined up a great resource to assist in soldering the DDS chip onto the printed circuit board. Once you've acquired your free AD9850BRS DDS chip from Analog Device, send the chip and your DDS Daughtercard circuit board, to Mike WA6OUW, at "KitBuilders". For $6 he will attach this surface mount chip to the pc board and return it promptly by mail. It's not tested because at that point it's only the DDS chip on a bare pc board, but Mike does excellent work. (The NJQRP uses KitBuilders for assembly of the HC908 Daughtercard product, so we know the quality is there!) Just place your DDS chip, pc board and a $6 check or M.O. payable to "KitBuilders" into a padded envelope and send to: KitBuilders, 1134 Cobblestone St., Salinas, Ca. 93905 . Within a week or so Mike will be able to solder on your DDS chip and return it by mail. You can contact Mike by email at wa6ouw@aol.com if you have further questions.

Kit Packaging

You won't believe the packaging of this kit. When you stop to think about it, it can get rather tricky kitting up a project that uses those tiny surface mount chips. NorCal did a splendid job with this challenge in their SMK-1 Transceiver Kit several years ago ... and we adapted Doug's technique for our special case on this project. Tom and Nancy Feeny (W8KOX and NJ8B) tackled this problem for the NJQRP and AmQRP Clubs and came up with a brilliant way of doing it. We won't give away all their secrets, but they ultimately provided all SMT chips taped onto a colour-coded strip of paper. You've *just* got to see this one to be-

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A TWO-CHIP I/O EXPANDER FOR IBM PC PARALLEL PRINTER PORT

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```
     p6 = 2;
     p7 = 3;

var
   ina, outa: word; {input, output port addresses}

{-------- Write an output port ---------}

procedure write_8243 (p: integer; b: byte);

var
   instr: byte; {8243 instruction}

begin
     instr := p + 4; {signifies "write to port ch"}
     port [outa] := instr + prog + oe;
     port [outa] := instr + oe;
     port [outa] := (b and 15) + oe;
     port [outa] := (b and 15) + prog + oe;
     port [outa] := prog + cs + oe;
     end;

{-------- Read an input port -------}

function read_8243 (p: integer): byte;

var
   instr: byte; {8243 instruction}

begin
     instr := p; {signifies "read from port ch"}
     port [outa] := instr + prog + oe;
     port [outa] := instr + oe;
     port [outa] := 0;
     read_8243 := (port[ina] div 16) xor 8;
     port [outa] := prog + cs;
     end;

{-------- Mainline --------}

const
     nlpt = 1;
     base: word = $40;
     offs: array[1..3] of word = ($08,$0A,$0C);

begin
     outa := memw[base:offs[nlpt]];
     ina := outa + 1;

     port [outa] := cs + prog;

     write_8243 (p4,15); {set port P4 to all 1's}
     writeln (read_8243(p5)); {read port P5}
end.
```

DDS "Daughtercard"

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lieve it. Their technique makes assembly of the kit foolproof and simple. Just slice the tape next to the component you are next installing, remove the part with a pair of needle nose pliers or tweezers and place/solder onto the board! W8KOX and NJ8B made up the DDS Daughtercard Kits for us using a splendid colour-coded technique that makes parts identification a breeze

The DDS Daughtercard Kit is available from the NJQRP Club for $23 (US & Canada) or $28 (DX). The kit includes a silk-screened/soldermasked pc board and surface mount components (caps and resistors), the oscillator module, pin header and MAR1 amplifier.

Last Modified: January 1, 2004

See :-

http://www.njqrp.org/dds/index.html

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Phone: +27 11 475 0566
Email: john.brock@pixie.co.za

Bulletins (Sundays at …)
11h15 Start call in of stations
11h30 Main bulletin start

Frequencies
439.000MHz 7.6MHz split
(West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

Radio Amateurs do it with more frequency!

Chairman/Treasurer	Dave	ZR6AOC	475 0566 (H)	zr6aoc@mweb.co.za
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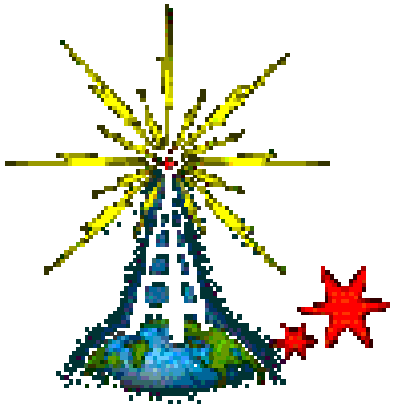
Member	Craig	ZR6CRW	795 1550 (H)	craig.woods@absamail.co.za

West Rand members - we need your input!

To make this the best ham radio magazine in South Africa we need your input. Please submit articles, comments, suggestions etc.

Please send plain text with no formatting to the email address below.

In July 2003, we re-published an Anode Compendium on CD. It has the issues from July 2000 until June this year. This included the new Adobe reader. It has been updated, check with the chairman for details.



We need your input! Email us articles, comments and suggestions please.
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