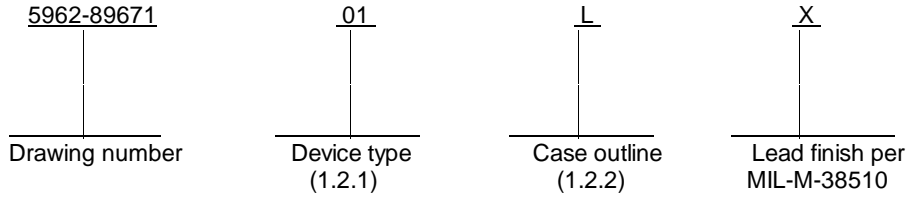| REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add a C-4 package. Make changes to 1.2.2, 6.6 and figure 1.	1990 APR 11	Monica L. Poelking

REV															
SHEET															
REV															
SHEET															
REV STATUS OF SHEETS		REV	A	A	A				A				A		
		SHEET	1	2	3	4	5	6	7	8	9	10	11	12	

PMIC N/A	PREPARED BY Rick C. Officer	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444		
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENC IES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Charles E. Besore	MICROCIRCUIT, LINEAR, DUAL 12-BIT BUFFERED MULTIPLYING CMOS D/A CONVERTER, MONOLITHIC SILICON		
	APPROVED BY Monica L. Poelking			
	DRAWING APPROVAL DATE 31 OCTOBER 1989	SIZE **A**	CAGE CODE **67268**	**5962-89671**
	REVISION LEVEL A	SHEET 1 OF 12		

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5962-E1670

1. SCOPE

1.1 <u>Scope</u>. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 <u>Part number</u>. The complete part number shall be as shown in the following example:

<u>5962-89671</u>   <u>01</u>   <u>L</u>   <u>X</u>

Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 <u>Device type(s)</u>. The device type(s) shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	DAC-8221A	Dual 12-bit buffered multiplying CMOS D/A converter

1.2.2 <u>Case outline(s)</u>. The case outline(s) shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
L	D-9 (24 lead, 1.280" x .310" x .200"), dual-in-line package
3	C-4 (28-terminal, .460" x .460" x.100"), square leadless chip carrier package

1.2.3 <u>Lead finish</u>. The lead finish shall be as specified in MIL-M-38510. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 <u>Absolute maximum ratings</u>.

V_{DD} to AGND	0 V dc, +17 V dc
V_{DD} to DGND	0 V dc, +17 V dc
AGND to DGND	-0.3 V dc, V_{DD} +0.3 V dc
Digital input voltage to DGND	-0.3 V dc, V_{DD} +0.3 V dc
I_{OUTA}, I_{OUTB} to AGND	-0.3 V dc, V_{DD} +0.3 V dc
V_{REFA}, V_{REFB} to AGND	±25 V dc
Voltage from R_{FBA}, R_{FBB} to AGND	±25 V dc
Power dissipation (P_D) to +75°C	500 mW 1/
Ambient operating temperature range	-55°C to +125°C
Storage temperature (soldering, 60 sec)	+300°C
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-M-38510, appendix C
Thermal resistance, junction-to-ambient (Θ_{JA})	
Case L	150°C
Case 3	110°C

1.4 <u>Recommended operating conditions</u>.

Ambient operating temperature range (T_A)	-55°C to +125°C
V_{REF}	±10 V dc
V_{OUTA} and V_{OUTB}	0 V dc
V_{DD}	+5 V dc or +15 V dc

1/ Derate above +75°C at 6.6 mW/°C.

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2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

  MILITARY

    MIL-M-38510   - Microcircuits, General Specification for.

STANDARDS

  MILITARY

    MIL-STD-883   - Test Methods and Procedures for Microelectronics.

BULLETIN

  MILITARY

    MIL-BUL-103   - List of Standardized Military Drawings (SMD's).

  (Copies of the specification, standard, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Functional diagram. The functional diagram shall be as specified on figure 3.

3.2.4 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

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TABLE I. <u>Electrical performance characteristics</u>.

Test	Symbol	Conditions -55° C $\leq T_A \leq$ +125° C $V_{OUTA} = V_{OUTB} = 0$ V; V_{DD} = +5 V or +15 V, $V_{REF} = \pm10$ V unless otherwise specified	Group A subgroups	Limits Min	Max	Unit
Relative accuracy	INL		1, 2, 3		±1/2	LSB
Differential nonlinearity	DNL		1, 2, 3		±1	LSB
Gain error	G_{FSE}		1, 2, 3		±1	LSB
DC power supply rejection ΔGain/ΔV_{DD} <u>1</u>/	PSRR		1, 2, 3		±.002	%/%
Output leakage current I_{OUTA}, I_{OUTB} <u>2</u>/	I_{LKG}		1 2, 3		±10 ±50	nA
Input resistance	R_{IN}		1, 2, 3	8	15	kΩ
Input resistance match	Delta R_{REF} / REF		1, 2, 3		±1.0	%
Digital input high	V_{IH}	V_{DD} = +5 V V_{DD} = +15 V	1, 2, 3	2.4 13.5		V
Digital input low	V_{IL}	V_{DD} = +5 V V_{DD} = +15 V	1, 2, 3		0.8 1.5	V
Input current	I_{IN}	V_{IN} = 0 V or V_{DD} and V_{IL} or V_{IH}	1 2, 3		±1.0 ±10.0	μA

See footnotes at end of table.

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TABLE I. <u>Electrical performance characteristics</u> - Continued.

Test	Symbol	Conditions $-55°C \leq T_A \leq +125°C$ $V_{OUTA} = V_{OUTB} = 0$ V; $V_{DD} = +5$ V or $+15$ V, $V_{REF} = \pm10$ V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Supply current	I_{DD}	Digital inputs V_{IL} or V_{IH}	1, 2, 3		2.0	mA
		Digital inputs 0 V or V_{DD}			0.1	
Input capacitance	C_{IN}	Measuring at D_{B0} - D_{B11} pins, see 4.3.1c	4		10	pF
		<u>Measur</u>ing at WR, CS, DAC A/DAC B pins, See 4.3.1c			15	
Functional tests		See 4.3.1d	7, 8			
Chip select to write setup time 3/	t_{CS}	$V_{DD} = +5$ V	9	130		ns
		$V_{DD} = +15$ V			70	
		$V_{DD} = +5$ V	10, 11 4/	160		
		$V_{DD} = +15$ V			70	
Chip select to write hold time 3/	t_{CH}		9, 10, 11 4/	0		ns
DAC select to write setup time 3/	t_{AS}	$V_{DD} = +5$ V	9	120		ns
		$V_{DD} = +15$ V			70	
		$V_{DD} = +5$ V	10, 11 4/	160		
		$V_{DD} = +15$ V			70	
DAC select to write hold time 3/	t_{AH}		9, 10, 11 4/	0		ns

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^\circ C \leq T_A \leq +125^\circ C$ $V_{OUTA} = V_{OUTB} = 0 V;$ $V_{DD} = +5 V$ or $+15 V,$ $V_{REF} = \pm 10 V$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Data valid to write setup time 3/	t_{DS}	$V_{DD} = +5 V$	9	190		ns
		$V_{DD} = +15 V$		90		
		$V_{DD} = +5 V$	10, 11	220		
		$V_{DD} = +15 V$	4/	90		
Data valid to write hold time 3/	t_{DH}	$V_{DD} = +5 V$	9, 10, 11	0		ns
		$V_{DD} = +15 V$	4/	10		
Write pulse width 3/	t_{WR}	$V_{DD} = +5 V$	9	140		ns
		$V_{DD} = +15 V$		90		
		$V_{DD} = +5 V$	10, 11	170		
		$V_{DD} = +15 V$	4/	90		

1/ Delta V_{DD} = ±5%.
2/ DAC loaded with 000 000 000 000.
3/ See figure 4.
4/ Subgroups 10 and 11, if not tested shall be guaranteed to the limits specified in table I.

   3.5 <u>Marking</u>. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

   3.6 <u>Certificate of compliance</u>. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.
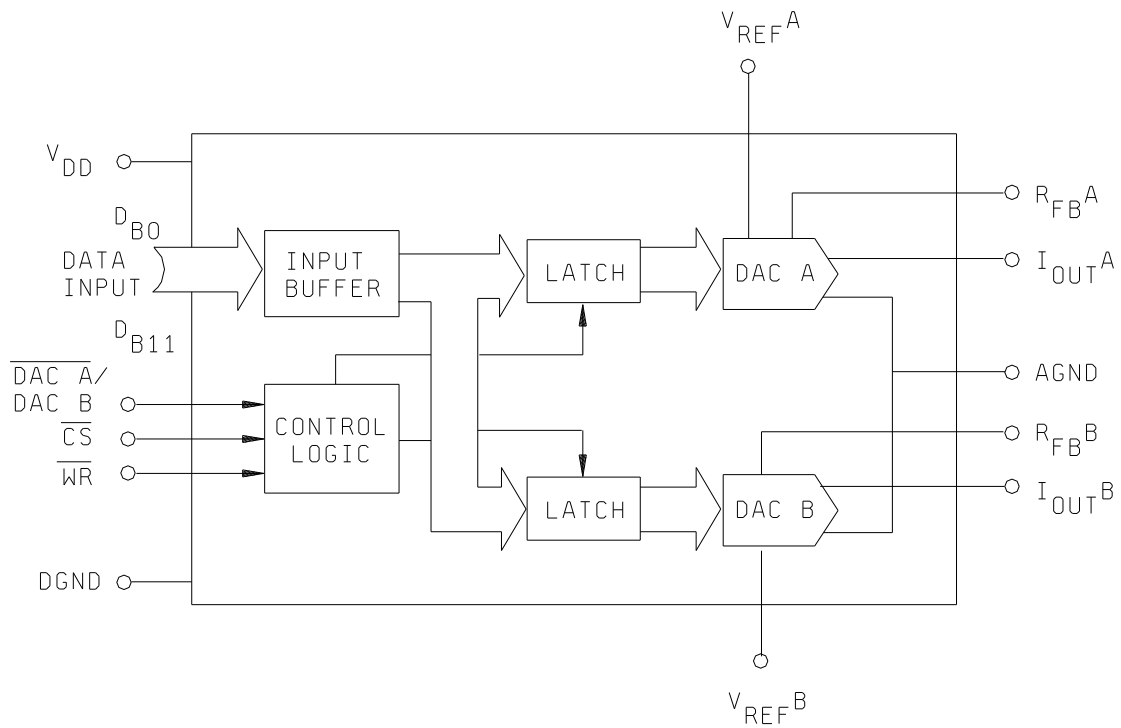
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Device type	01	
Case outline	L	3

Terminal number	Terminal symbol	
1	AGND	NC
2	$I_{OUT}A$	AGND
3	$R_{FB}A$	$I_{OUT}A$
4	$V_{REF}A$	$R_{FB}A$
5	DGND	$V_{REF}A$
6	D_{B11} (MSB)	DGND
7	D_{B10}	D_{B11} (MSB)
8	D_{B9}	NC
9	D_{B8}	D_{B10}
10	D_{B7}	D_{B9}
11	D_{B6}	D_{B8}
12	D_{B5}	D_{B7}
13	D_{B4}	D_{B6}
14	D_{B3}	D_{B5}
15	D_{B2}	NC
16	D_{B1}	D_{B4}
17	D_{B0} (LSB)	D_{B3}
18	$\overline{DA}$C A/DAC B	D_{B2}
19	$\overline{CS}$	D_{B1}
20	WR	D_{B0} (LSB)
21	V_{DD}	$\overline{DA}$C A/DAC B
22	$V_{REF}B$	$\overline{NC}$
23	$R_{FB}B$	$\overline{CS}$
24	$I_{OUT}B$	WR
25	---	V_{DD}
26	---	$V_{REF}B$
27	---	$R_{FB}B$
28	---	$I_{OUT}B$

FIGURE 1. Terminal connections.

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$\overline{\text{DAC A}/}$ DAC B	$\overline{\text{CS}}$	$\overline{\text{WR}}$	DAC A	DAC B
L	L	L	WRITE	HOLD
H	L	L	HOLD	WRITE
X	H	X	HOLD	HOLD
X	X	H	HOLD	HOLD

L = Low state
H = High state
X = Don't care

FIGURE 2. Truth table.

FIGURE 3. Functional diagram.

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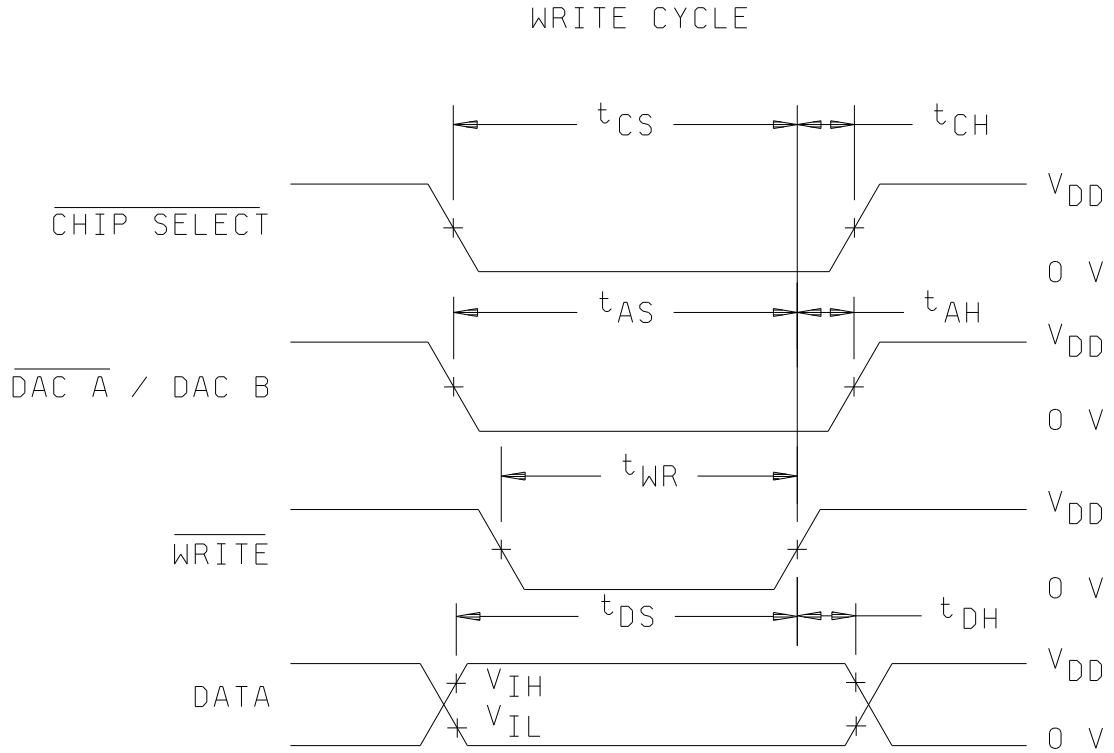DEFENSE ELECTRONICS SUPPLY CENTER
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WRITE CYCLE

NOTES:
  1. All input signal rise and fall times measured from 10 percent to 90 percent of V_{DD}.
     V_{DD} = +5 V, $t_r = t_f$ = 20 ns;
     V_{DD} = +15 V, $t_r = t_f$ = 40 ns.

  2. Timing measurement reference level is $\dfrac{V_{IH} + V_{IL}}{2}$

FIGURE 4. Timing diagram.

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3.7 <u>Certificate of conformance</u>. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 <u>Notification of change</u>. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 <u>Verification and review</u>. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 <u>Sampling and inspection</u>. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 <u>Screening</u>. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

    a. Burn-in test, method 1015 of MIL-STD-883.

       (1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

       (2) $T_A = +125^\circ$ C, minimum.

    b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 <u>Quality conformance inspection</u>. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 <u>Group A inspection</u>.

    a. Tests shall be as specified in table II herein.

    b. Subgroups 5 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

    c. Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance.

    d. Subgroups 7 and 8 shall include verification of the truth table.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 7, 8
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 8, 9, 10**, 11**
Group C and D end-point electrical parameters (method 5005)	1

　* PDA applies to subgroup 1.
　** Subgroups 10 and 11, if not tested, shall be guaranteed
　　to the limits specified in table I.

4.3.2 Groups C and D inspections.

　a. End-point electrical parameters shall be as specified in table II herein.

　b. Steady-state life test conditions, method 1005 of MIL-STD-883.

　　(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

　　(2) T_A = +125° C, minimum.

　　(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

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6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5377.

6.6 Approved sources of supply. An approved source of supply is listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become avaiable. The vendor listed in MIL-BUL-103 has agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved source of supply listed below is for information purposes only and is current only to the date of the last action of this document.

military drawing part number	Vendor CAGE number	Vendor similar PIN 1/	Replacement military specification part number
5962-8967101LX	06665	DAC-8221AW	
5962-89671013X	06665	DAC-8221ATC	

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
06665	Precision Monolithics, Incorporated 1500 Space Park Drive P.O. Box 58020 Santa Clara, CA 95050-8020

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