

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Corrected part numbering, added MIL-STD-454 and MIL-C-45662 requirements, and paragraph reference to interim electrical tests.	8/30/91	Jack Niles
B	Remove canceled references, add pure tin paragraph and update sampling plan requirements.	9/15/11	Michael Radecki

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
 DEFENSE LOGISTICS AGENCY
 LAND AND MARITIME
 COLUMBUS, OHIO 43218-3990

Prepared in accordance with ASME Y14.100

Selected item drawing

REV STATUS OF PAGES	REV	B	B	B	B	B	B	B	B	B	B	B				
	PAGES	1	2	3	4	5	6	7	8	9	10	11	12			
PMIC N/A	PREPARED BY Jack Niles							DESIGN ACTIVITY DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OH 45444-5000								
Original date of drawing 16 October 1989	CHECKED BY Jack Niles							TITLE POWER DIVIDER, 4-WAY, 0 DEGREE, CONNECTORS								
	APPROVED BY Terry Armstrong															
	SIZE A	CODE IDENT. NO. 14933						DWG NO. 89112								
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1. SCOPE

1.1 Scope. This drawing describes the detail requirements for a group of power dividers for use in military systems and provides a level of item quality and reliability assurance for acquisition of items meeting the intent of MIL-DTL-23971.

1.2 Part or Identifying Number (PIN). The complete PIN shall be as follows:



2. APPLICABLE DOCUMENTS.

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-E-5400 - Electronic Equipment, Aerospace, General Specification for.
- MIL-DTL-14072 - Finishes for Ground Electronic Equipment.
- MIL-DTL-23971 - Power Dividers, Power Combiners, and Power Divider/Combiners, General Specification for.
- MIL-PRF-39012 - Connectors, Coaxial, Radio Frequency, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-1285 - Marking of Electrical and Electronic Parts.
- MIL-STD-1916 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

- NCSL - Z 540.3 - Calibration Laboratories and Measuring and Test Equipment.

(Copies of these documents are available from <http://www.ncsli.org> or to National Conference of Standards Laboratories (NCSL), 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404.)

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(Copies are available online at <http://iso.org> or <http://www.iso.org/iso/home.htm> or from American National Standards Institute, 13th Floor, 11 West 42nd Street, New York, NY 10036-0350.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Electrical performance characteristics. The electrical performance characteristics shall be as specified herein and shall apply over the full operating temperature range specified in 3.2.1.1.

3.1.1 Impedance. The input and output impedance shall be 50 ohms.

3.1.2 Frequency range. The frequency range of the power dividers shall be:

- 01 0.5 to 2.0 GHz
- 03 2.0 to 18.0 GHz
- 05 0.5 to 18.0 GHz
- 07 6.0 to 18.0 GHz

3.1.3 Average coupling. The average coupling to each of the output ports shall be:

- 01 6.0 ±0.2 dB
- 03 6.0 ±0.5 dB
- 05 6.0 ±0.5 dB
- 07 6.0 ±0.5 dB

3.1.4 Insertion loss. The maximum insertion loss for each power divider shall be:

- 01 1.1 dB
- 03 1.8 dB
- 05 3.8 dB
- 07 0.9 dB

3.1.5 Isolation. The minimum isolation between output ports of the power dividers shall be:

- 01 20 dB
- 03 18 dB
- 05 16 dB
- 07 19 dB

3.1.6 Amplitude balance. The maximum amplitude balance error between output ports of the power dividers shall be:

- 01 0.3 dB
- 03 0.8 dB
- 05 1.2 dB
- 07 0.5 dB

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3.1.7 Phase balance. The maximum phase balance error between output ports of the power dividers shall be:

- 01 4.0 degrees
- 03 10.0 degrees
- 05 14.0 degrees
- 07 6.0 degrees

3.1.8 VSWR. The maximum VSWR for input and output ports of the power dividers shall be:

	Input	Output
-01	1.45:1	1.25:1
-03	1.5:1	1.4:1
-05	1.6:1	1.45:1
-07	1.4:1	1.4:1

3.1.9 RF power. The power dividers shall be capable of normal operation with a minimum applied RF power level values for load VSWR's of 1.2, 2.0 and infinity are 30, 20 and 1 watts respectively.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified on figure 1 and herein.

3.2.1 Temperature range.

3.2.1.1 Operating temperature range. The item shall meet the electrical requirements specified in 3.1 over an ambient temperature range of -55°C to +85°C.

3.2.1.2 Storage temperature range. The item shall withstand an ambient temperature range of -65°C to +100°C for storage and transport without degradation of performance.

3.2.2 Parts, materials, and processes. All parts, materials, and processes used in the fabrication of the item shall be in accordance with the requirements specified in MIL-E-5400.

3.2.2.1 Connections.

3.2.2.1.1 RF connectors. The RF connectors shall be field replaceable female type SMA to mate with male type SMA connectors and shall be in accordance with MIL-PRF-39012. Items supplied to this drawing shall meet the electrical requirements specified in 3.1 with the connectors mounted.

3.2.2.1.2 Connector caps. All SMA connectors shall be sealed with push-on plastic caps to prevent both damage and the entrance of moisture and foreign material during storage.

3.2.2.2 Finish. The finish shall be in accordance with MIL-DTL-14072. The finish shall be electrically conductive and compatible with aluminum.

3.2.3 Weight. The unit weight shall not exceed 2.0 ounces.

3.2.4 Physical dimensions. The physical dimensions and package configuration shall be as specified on figure 1.

3.3 Thermal shock. When items are tested as specified in 4.6.3, there shall be no physical damage. Upon completion of this test, items shall meet the electrical requirements specified in 3.1.

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3.4 Vibration. When items are tested as specified in 4.6.4, there shall be no evidence of physical damage. Upon completion of this test, items shall meet the electrical requirements specified in 3.1.

3.5 Shock. When items are tested as specified in 4.6.5, there shall be no evidence of physical damage. Upon completion of this test, items shall meet the electrical requirements specified in 3.1.

3.6 Seal. After items are tested as specified in 4.6.6.1 or 4.6.6.2, as applicable, they shall meet the electrical requirements specified in 3.1.

3.7 Barometric pressure. When items are tested as specified in 4.6.7, there shall be no evidence of physical damage. During the test, the electrical characteristics shall be as specified in 4.6.2.

3.8 Resistance to solvents. When items are tested as specified in 4.6.8, there shall be no evidence of illegible marking, mechanical damage, or deterioration of material or finishes. Upon the completion of this test, items shall meet the electrical requirements specified in 3.1.

3.9 Temperature extreme. When the items are tested as specified in 4.6.9, there shall be no physical damage and the items shall meet the electrical requirements specified in 3.1 during this test.

3.10 Moisture resistance. When the items are tested as specified in 4.6.10, there shall be no evidence of damage. Upon the completion of this test, items shall meet the electrical requirements specified in 3.1.

3.11 Salt atmosphere. When the items are tested as specified in 4.6.11, there shall be no evidence of warping, cracking, peeling, excessive corrosion, or in case of plated metals, corrosion that has passed through the plating and exposed the base metal. Upon the completion of this test, items shall meet the electrical requirements specified in 3.1.

3.12 Marking. The items supplied to this drawing shall be marked in accordance with MIL-STD-1285 with the following information:

- a. Manufacturer's identification.
- b. Drawing PIN (see 1.2).
- c. Lot date code.
- d. Serial number.
- e. Input connector.
- f. Output connectors.

3.13 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of power divider components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.3).

3.14 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.15 Manufacturer eligibility. To be eligible for listing as an approved source of supply, perform the group A and group B inspections specified herein on a sample agreed upon by the manufacturer and DLA Land and Maritime-VA.

3.16 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be listed as an approved source of supply.

3.17 Workmanship. The power divider shall be uniform in quality and free from any defects that will affect life, serviceability, or appearance.

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4. VERIFICATION

4.1 Responsibility for inspection. Unless otherwise specified in the purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. The supplier shall maintain a quality system as specified in the purchase documentation. Except as otherwise specified in the purchase order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the acquiring activity. The acquiring activity reserves the right to perform any of the inspections specified herein where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facilities. Test and measuring equipment, and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspections shall be established and maintained by the supplier. The establishment and maintenance of equipment calibration shall be in accordance with the requirements specified in NCSL-Z540.3, ISO10012 or equivalent.

4.2 Classification of inspection. The inspections specified herein are classified as follows:

- a. Materials inspection (see 4.3).
- b. Conformance inspection (see 4.5).

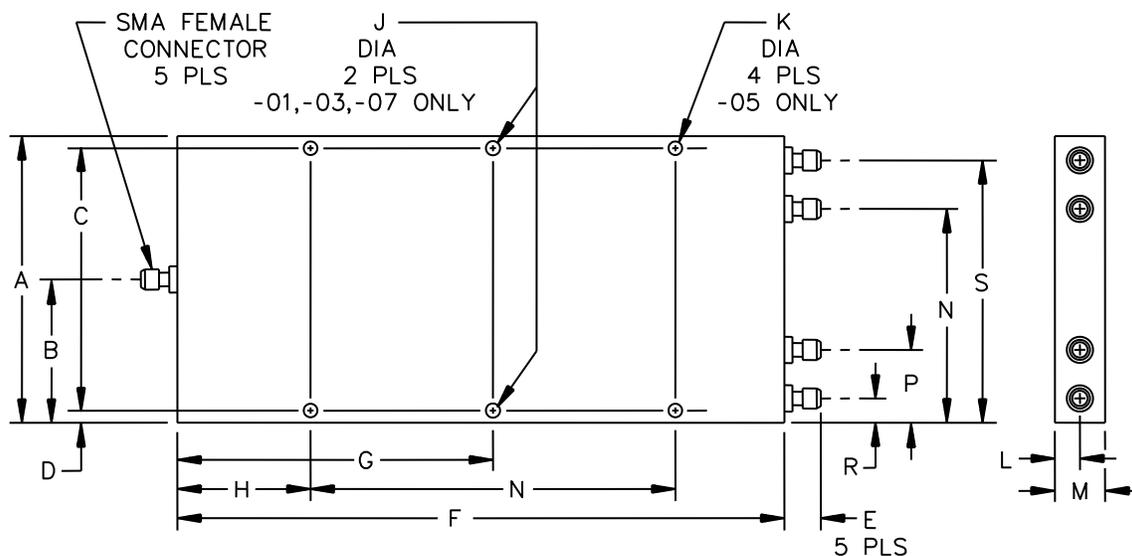


FIGURE 1. Physical configuration.

<p align="center">DLA LAND AND MARITIME COLUMBUS, OHIO</p>	<p align="center">SIZE A</p>	<p align="center">CODE IDENT NO. 037Z3</p>	<p align="center">DWG NO. 89112</p>
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Ltr	Dimensions			
	Dash numbers			
	-01	-03	-05	-07
A	2.38	1.98	2.952	1.98
B	1.19	.99	1.476	.99
C	2.153	1.688	2.702	1.688
D	.12	.17	.125	.17
E	.41	.38	.375	.38
F	2.15	3.49	6.240	1.46
G	1.07	1.74	---	.73
H	---	---	1.370	---
N	---	---	3.750	---
J	.104 +.004 -.002	146 ±.005	---	.146±.005
K	---	---	.140 ± .005	---
L	.20	.20	.257	.20
M	.40	.40	.515 +.004 -.000	.40

Inches	mm	Inches	mm	Inches	mm
.002	0.05	.38	9.7	1.688	42.88
.004	0.10	.40	10.2	1.74	44.2
.005	0.13	.41	10.4	1.98	50.3
.015	0.38	.515	13.08	2.15	59.6
.104	2.64	.73	18.5	2.153	55.69
.12	3.0	.750	19.05	2.202	55.93
.125	3.18	.99	25.1	2.38	60.5
.140	3.56	1.07	27.2	2.702	68.63
.17	4.3	1.19	30.2	2.952	74.98
.250	6.35	1.370	34.80	3.49	88.6
.257	6.53	1.46	37.1	5.240	133.10
.375	9.52	1.476	37.49		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, all dimensions are maximum.

FIGURE 1. Physical configurations - Continued.

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4.3 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials used in the fabrication of the items are in accordance with the requirements specified herein.

4.4 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with test conditions specified in the "General Requirements" of MIL-STD-202.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of the product for delivery shall consist of group A inspection.

4.5.1.1 Inspection lot. An inspection lot shall consist of all items with the same PIN produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.2 Group A inspection. Group A inspection shall consist of the tests and examinations specified in table II.

4.5.1.2.1 Sampling plan. A sample of power dividers shall be randomly selected in accordance with table III, if one or more defects are found, the lot shall be rescreened and defect removed. After screening and removal of defects, a new sample of power dividers shall be randomly selected in accordance with table III, if one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

TABLE II. Group A inspection.

Inspection	Requirement	Test method
<u>Subgroup 1</u>		
Visual and mechanical examination	3.2, 3.12, and 3.13	4.6.1
Seal	3.6	4.6.6
Electrical characteristics		
Frequency range	3.1.2	4.6.12
Average coupling	3.1.3	4.6.12
Insertion loss	3.1.4	4.6.12
Isolation	3.1.5	4.6.12
Amplitude balance	3.1.6	4.6.12
Phase balance	3.1.7	4.6.12
VSWR	3.1.8	4.6.12
RF power	3.1.9	4.6.12
<u>Subgroup 2</u>		
Thermal shock	3.3	4.6.3
Vibration	3.4	4.6.4
Seal	3.6	4.6.6
Interim electrical test (4.6.2)		

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TABLE III. Group A sampling plan with accept on zero defect.

LOT SIZE	Electrical Characteristics <u>1/</u>	RF Characteristics <u>2/</u>	Visual and mechanical examination	
			Major	Minor
1 to 8	100 percent	100 percent	100 percent	3
9 to 15	100 percent	13	13	3
16 to 25	100 percent	13	13	3
26 to 50	100 percent	13	13	5
51 to 90	100 percent	13	13	6
91 to 150	125	13	13	7
151 to 280	125	20	20	10
281 to 500	125	29	29	11

1/ Electrical characteristics are frequency range, average coupling, insertion loss, isolation and phase balance.

2/ RF characteristics are seal, amplitude balance, VSWR, RF power, thermal shock, vibration and interim electrical test.

4.5.2 Group B inspection. When specified on the purchase order, group B inspection shall consist of the inspections specified in table IV, in the order shown. Group B inspection shall be made on sample units selected from inspection lots which have passed the group A inspection.

4.5.2.1 Sampling plan. Four sample units shall be selected.

4.5.2.2 Failure. If one or more sample units fail to pass group B inspection, the sample shall be considered to have failed.

4.5.2.3 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on any purchase order.

TABLE IV. Group B inspection

Inspection	Requirement	Test method
<u>Subgroup 1 (2 sample units)</u>		
Thermal shock	3.3	4.6.3
Vibration	3.4	4.6.4
Shock	3.5	4.6.5
Seal	3.6	4.6.6
Barometric pressure	3.7	4.6.7
Interim electrical test (4.6.2)		
<u>Subgroup 2 (2 sample units)</u>		
Resistance to solvents	3.8	4.6.8
Temperature extreme	3.9	4.6.9
Moisture resistance	3.10	4.6.10
Salt atmosphere	3.11	4.6.11
Interim electrical test (4.6.2)		

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4.6 Methods of examination and test.

4.6.1 Visual and mechanical examination. The items shall be examined to verify that the material, design, construction, physical dimensions, marking and workmanship are as specified herein.

4.6.2 Interim electrical test. The interim electrical test shall consist of the following electrical parameter measurements at room temperature:

- a. Insertion loss (see 3.1.4).
- b. Isolation (see 3.1.5).
- c. Phase balance (see 3.1.7).

4.6.3 Thermal shock. Items shall be tested in accordance with method 107 of MIL-STD-202. The following detail shall apply: Test condition letter: B.

4.6.4 Vibration.

4.6.4.1 High frequency. Items shall be tested in accordance with method 204 of MIL-STD-202. The following detail shall apply: Test condition letter: B.

4.6.5 Shock. Items shall be tested in accordance with method 213 of MIL-STD-202. The following shall apply: Test condition letter: A.

4.6.6 Seal (use 4.6.6.1 or 4.6.6.2, as applicable).

4.6.6.1 Hermetic seal. Items shall be tested in accordance with method 112 of MIL-STD-202. The following details shall apply:

- a. Unless otherwise specified, test condition letter: C.
- b. Procedure IIIA.
- c. Degree of leakage rate sensitivity:
 - (1) 10^{-6} atm cm³/s for items whose volume is greater than 2 cubic inches.
 - (2) 10^{-8} atm cm³/s for items whose volume is 2 cubic inches or less.

4.6.6.2 Immersion. Items shall be tested in accordance with method 104 of MIL-STD-202. The following detail shall apply: Test condition letter: B.

4.6.7 Barometric pressure. The items shall be tested in accordance with method 105 of MIL-STD-202. The following details shall apply:

- a. Method of mounting: Normal mounting means.
- b. Test condition letter: B.

4.6.8 Resistance to solvents. The items shall be tested in accordance with method 215 of MIL-STD-202. The following details shall apply:

- a. Portion of the items to be brushed: The marked portion of the items.
- b. Number of items to be tested: All.

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4.6.9 Temperature extreme. The items shall be tested at both the specified high temperature and low temperature operating ranges.

4.6.10 Moisture resistance. The items shall be tested in accordance with method 106 of MIL-STD-202.

4.6.11 Salt atmosphere. The items shall be tested in accordance with method 101 of MIL-STD-202. The following details shall apply:

- a. Mounting: Normal mounting means.
- b. Test condition letter: B.

4.6.12 Electrical characteristics. The electrical characteristics specified in 3.1 shall be determined by electrical test methods specified by supplier. The individual test procedures shall be documented and subject to review and approval by the acquiring activity.

5. PACKAGING

5.1 Packaging requirements. Packaging requirements shall be in accordance with MIL-DTL-23971.

5.1.1 Preservation. Preservation shall be level C.

5.1.2 Packing. Packing shall be level C.

5.1.3 Marking. In addition to any other special marking required by the acquisition document order (see 6.2), each unit package, intermediate and exterior containers and unitized loads shall be marked with the PIN of this drawing. Marking shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Design changes. Suggested design improvements shall be referred to the acquiring activity for review. There shall be no change made in either the electrical or mechanical design, or in the materials used in the manufacture of the item covered by this drawing without notification and approval of the acquiring activity.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. This drawing.
- b. Test data required to assure conformance to the requirements of section 3.
- c. Special marking requirements, if any.
- d. Special preservation-packing, packing requirements, if any.
- e. Special sampling plan, if any.

6.3 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

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6.4 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmentally Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Included in the list of 31 priority chemicals are cadmium, lead, and mercury. Use of the materials on the list should be minimized or eliminated unless needed to meet the requirements specified herein (see [section 3](#)).

6.5 User of record. Coordination of this document for future revisions is coordinated only with the approved source of supply and the users of record of this document. Requests to be added as a recorded user of this drawing may be achieved online at TubesAmps@dla.mil or in writing to: DSCC-VAT, Post Office Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-0551 or DSN 850-0551.

6.6 Approved source of supply. An approved source of supply is listed herein. Additional sources will be added as they become available. The vendor listed on the requirements drawing has agreed to this drawing and a certificate of compliance has been submitted to DLA Land and Maritime-VAT.

Vender CAGE
Number
 1U0Z0

Vendor name
and address
 Ohio Microwave LLC
 848 A East Franklin St.
 Centerville, OH 45459

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