

February 27, 1976

R. E. Hatton
G. J. Levinskas

Data Sheets on MCS-1238, MCS-1865 &

MCS-2866 Fluids

T. H. Bottini

O. P. DeGarmo

R. N. Perotti

C. E. Weber

The attached copy, which requires your review and approval, is for temporary data sheets on MCS-1238 capacitor fluid and MCS-1865 and MCS-1866 transformer fluids. They will be replaced with more extensive literature at a later date.

You will note that the "handling precautions" statement is missing from the data sheet on MCS-1865/1866 fluids. My understanding is that Dr. Levinskas is currently preparing a statement and that it will be added before the data sheet is distributed.

Thank you in advance for your review and approval of this literature.

W. D. Lubic
W. D. Lubic

*Veroy cover sheet
to W.D. Lubic +
D. Wood*

*Attached is acceptable to
Dept. Med + Env. Health as
it relates to toxicity + env.
areas.*

*Since I was not an
addressee, I had not
commented on it earlier.
G. J. Levinskas
14 Mar 76*

0205577

File

492

DATE : February 27, 1976 CC: R. E. Hatton

SUBJECT : Data Sheets on MCS-1238, MCS-1865 &

REFERENCE : MCS-2866 Fluids

TO : T. H. Bottini
~~_____~~
R. N. Perotti
C. E. Weber

The attached copy, which requires your review and approval, is for temporary data sheets on MCS-1238 capacitor fluid and MCS-1865 and MCS-1866 transformer fluids. They will be replaced with more extensive literature at a later date.

You will note that the "handling precautions" statement is missing from the data sheet on MCS-1865/1866 fluids. My understanding is that Dr. Levinskas is currently preparing a statement and that it will be added before the data sheet is distributed.

Thank you in advance for your review and approval of this literature.

W. D. Lubic

Copy to ↑
Sections referring to health,
handling and environment
are acceptable to Dept Med &
Env. Health.
S/P Levinskas

0205533

JOB ORDER

- ☐ TECHNICAL CREATIVE SERVICES
☐ PRODUCTION & TRAFFIC
☒ PROMOTIONAL DESIGN

C.A.P. JOB NUMBER

CHARGE NUMBER
45-000-352.23-350

NAME OF ORIGINATOR
W. D. Lubic

TEL. NO. 4-2630

DATE 3/22/76

CO. OR DEPT. MIC/Advertising -- Fluids

COMPLETED BY
April 5, 1976

GOALS OF ADVERTISEMENT OR PRINTED MATERIAL:

MEDIA TO BE USED IF REQUESTED FOR AD PRODUCTION

INSTRUCTIONS

Keep costs to minimum

- cold type
- white stock, 8 1/2 x 11 sheets, one side
- bind with staple in upper left corner

JOB TITLE AND DESCRIPTION

- 1) Technical Data Sheet -- MCS-1865 and MCS-1866 Transformer Fluids
- 2) Technical Data Sheet -- MCS-1238 Capacitor Fluid

QUANTITY

500 each

SIZE

8 1/2 x 11

NO. OF COLORS

2 color

☒ NEW JOB ☐ RE-RUN ☐ RE-RUN/CHANGES

COST ESTIMATE

SHIPPING INFORMATION

Deliver to Dr. R. E. W. Hatton, B28

SAMPLES TO

10 each to W. D. Lubic (BINB)

DO NOT WRITE BELOW

	ASSIGNED	DUE	DELIVERED
LAYOUT			
TYPE			
ART			
PRINTING			0205535
BROWN PRINT			

DATE March 19, 1976

JOB IC/FF-54 Master Copy

W. D. Lubic

Monsanto (logo)

TECHNICAL DATA SHEET

No. IC/FF-54

(Date: Mo/Yr)

MCS-1238

CAPACITOR FLUID

MCS-1238 is suggested as a capacitor impregnant dielectric fluid to directly replace presently used polychlorinated biphenyl (PCB) fluids. It was designed to provide the outstanding dielectric characteristics of PCB impregnant fluids such as Aroclor® 1016.

MCS-1238 fluid consists of a chlorine-free synthetic aromatic hydrocarbon combined with a high dielectric constant aryl sulfone and additives to give good dielectric properties. Because of its relatively high dielectric constant and other characteristics, it can be used in present capacitor types with minimum dielectric redesign. MCS-1238 fluid is not as fire resistant* as the presently used Aroclor 1016; however, no flammability standards for capacitor impregnant fluids have been adopted and MCS-1238 appears to be somewhat less flammable than equivalent viscosity petroleum oils. Based upon initial test data, MCS-1238 is acceptable from human and environmental health considerations; it does biodegrade and does not bioaccumulate.

0205536

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In addition, MCS-1238 fluid compared to Aroclor 1016 has much better low temperature characteristics, can be used in metallized paper/film capacitors, is better in DC capacitors and has better high frequency characteristics.

Typical data for MCS-1238, determined on various samples of fluid, are given in the following sections. Material is available for evaluation.

Put on first pg.

- Standard Disclaimer Clause (boxed)
- *Fire Resistance Disclaimer (boxed) from p. 12, Legal Guidelines
- Monsanto logo
- MIC Address Line

TYPICAL DATA*

ELECTRICAL PROPERTIES

Dielectric constant at 25°C, 60 Hz (ASTM D924)	6.0
Dielectric constant at 100°C, 60 Hz (ASTM D924)	5.1
Dissipation factor, 100°C, 60 Hz (ASTM D877)	0.046
Resistivity, 100°C, 10^9 ohm cm (ASTM D1169)	1,000
In MCS-1238 impregnated capacitors (2 microfarad, 585 VAC, 2 layers .66 mil paper, 0.3% Unox added)	
Capacitance at 25°C	1.97
Dissipation factor at 25°C	0.0037
Capacitance at 90°C	1.87
Dissipation factor at 90°C	0.0039

0205537

* This data is based upon samples tested in the laboratory and is not guaranteed for all samples.

TYPICAL DATA*

PHYSICAL AND CHEMICAL PROPERTIES

Specific gravity, 25/25°C (ASTM D1810)	1.018
Viscosity, at 100°F (37.8°C) (ASTM D445)	9.1 cs.
Viscosity, at 210°F (98.9°C)	1.98 cs.
Pour Point (ASTM D97)	-60°F (-51°C)
Flash Point (ASTM D92)	303°F (150°C)
Fire Point (ASTM D92)	328°F (165°C)
Autogenous Ignition Temperature (ASTM D2215)	835°F (446°C)
Hydrolysis (NN after 168 hrs. at 210°F with 0.5% H ₂ O and aluminum and steel present)	0.00
Vapor Pressure	95°C 1 torr
	150°C 10 torr
	220°C 100 torr

* This data is based upon samples tested in the laboratory and is not guaranteed for all samples.

SPECIFICATIONS*

CHARACTERISTICS	LIMITS
Appearance	A clear colorless to light straw liquid.
Specific Gravity at 25°/25°C	1.01 - 1.03
Viscosity @ 37.8°C	9 - 12 cs.
Flash Point	300°F Minimum
Fire Point	320°F Minimum
Moisture	0.005% Maximum
Df 100°C/60 Hz	0.05 Maximum
DK 100°C	5.0 - 5.2

0205538

* These specifications are tentative and subject to confirmation or change as experience is developed.

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PCB-ARCH0748732

MATERIALS COMPATIBILITY

MCS-1238 is compatible with all currently used dielectric materials; paper, polypropylene film, paper/film combination, metallized paper and metallized film. It is also generally compatible with other capacitor materials of construction used with Aroclor 1016 chlorinated hydrocarbons. One exception is that two part epoxy sealants should not be used with MCS-1238.

It is recommended that compatibility tests be conducted with the fluid and samples of the specific materials to be used under conditions simulative of actual use. ASTM D3255, Method for Investigating the Compatibility of Transformer Insulation and Construction Materials in Askarels, has been found useful in compatibility testing.

HANDLING PRECAUTIONS

Since MCS-1238 may cause a moderate degree of skin irritation, care should be taken to avoid prolonged or repeated skin contact with this product. Should dermal contact occur, remove contaminant by washing with soap and water. In case of eye contact, flush eyes thoroughly with large amounts of water.

This product appears to possess no other acute toxicologic

properties which would require special handling other than the good hygiene practices employed with any industrial chemical.

RECOMMENDATIONS FOR USE

An antioxidant and an epoxide scavenger should be used with MCS-1238. Ionol* (2,6-ditertiary butyl para cresol) antioxidant is present in the new fluid and 0.01% should be added to the fluid during each purification cycle in the capacitor impregnation process. A convenient method of handling the Ionol is to dissolve the required amount in a small amount of MCS-1238 and add the resulting solution to the batch of fluid.

The suggested sequence of MCS-1238 fluid preparation is similar to that used to Aroclor 1016 chlorinated hydrocarbons; specifically, remove moisture (20 ppm maximum), add epoxide, clay treat, add antioxidant, degas and then use the fluid for impregnation. Conditions for each step are determined by the specific equipment used; therefore, no operating details are listed.

SHIPPING INFORMATION

MCS-1238 is available in standard steel drums and cans. Shipping classification is Plastics Synthetic Liquid NOIBN.

* Trademark of Shell Chemical Company

MCS-1238 labels must contain the following statement:

CAUTION - MAY CAUSE SKIN IRRITATION.

AVOID PROLONGED OR REPEATED CONTACT WITH SKIN.

FIRST AID: IN CASE OF CONTACT, WASH THOROUGHLY WITH WATER.

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Monsanto (logo)
EX P-3163
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PCB-ARCH0748735

DATE March 19, 1976
JOB IC/FF-57 Master Copy
W. D. Lubic

Monsanto (logo)

TECHNICAL DATA SHEET

No. IC/FF-57
(Date: Mo/Yr)

MCS-1865 AND MCS-1866

TRANSFORMER FLUIDS

Fluids for use in liquid-filled transformers should have high dielectric strength, wide operating temperature range, good heat transfer properties, chemical stability and be fire resistant*. MCS-1865 and MCS-1866 were developed to provide such characteristics, and are suggested for evaluation as dielectric fluids for transformers. These fluids have a considerable degree of fire resistance, but are not equivalent to askarels in this ~~general characteristic~~ *particular feature.*

MCS-1865 and MCS-1866 do not contain polychlorinated biphenyl (PCB). Both MCS-1865 and MCS-1866 are synthetic hydrocarbons combined with trichloro^obenzene to give the desired viscosity level.

Standard Disclaimer Clause (boxed)

*Fire Resistance Disclaimer (boxed)

Monsanto (logo)

MIC Address Line

0205542

Monsanto
EXP-3163
Page 10 of 25

Technical data on typical laboratory samples are given below. Additional studies are underway to develop further data. Samples are available for preliminary evaluation.

TYPICAL DATA*

	<u>MCS-1865</u>	<u>MCS-1866</u>
<u>ELECTRICAL PROPERTIES</u>		
Dielectric Strength (ASTM D877) 25°C, 0.1 inch gap	> 50 KV	42.1 KV
Impulse Strength	>120, <160 KV	-
Power Factor, 100°C, 60 Hz (ASTM D924)	0.11%	0.01%
Dielectric Constant, 100°C, 60 Hz (ASTM D924)	2.56	2.74
Gassing Tendency (ASTM D2298)	9.5 ml/min.	41.2, 31.7 ml/min.
<u>FIRE RELATED PROPERTIES</u>		
Flash Point (ASTM D92)	315°F (157°C)	310°F (154°C)
Fire Point (ASTM D92)	None to b.p. (390°F [200°C])	None to b.p. (390°F [200°C])
Auto Ignition Temp., (ASTM D2155)	750°F (399°C)	800°F (427°C)
Oxygen Index	18.3	17.1
<u>PHYSICAL PROPERTIES</u>		0205543
Specific Gravity		
@ -30°C	1.027	1.088
-15°C	1.016	1.076
0°C	1.005	1.065
25°C	0.987	1.045
50°C	0.970	1.026
100°C	0.933	0.988
150°C	0.895	0.948

*This data is based upon samples tested in the laboratory ~~EXP-3463~~
not guaranteed for all samples.

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PCB-ARCH0748737

	<u>MCS-1865</u>	<u>MCS-1866</u>
Coefficient of Exp., ml/ml, °C	0.000750	0.000761
Viscosity, cs.		
@ -40°C	19,620	-
-30°C	5,119	1830
-15°C	1,040	426
0°C	306	140
25°C	69.5	37
50°C	24.4	14.7
100°C	6.44	4.50
150°C	2.88	2.18
Pour Point (ASTM D97)	-50°F (-45°C)	-50°F (-45°C)
Temperature °C at which Vapor Pressure is:		
1 Torr	58	49
10 Torr	104	96
100 Torr	169	161
760 Torr	248	240
Specific Heat, BTU/lb.		
@ 25°F	0.412	0.390
50°F	0.430	0.406
100°F	0.466	0.438
150°F	0.501	0.470
Thermal Conductivity BTU/ft., hr.		
@ 25°F	0.0785	0.0744
50°F	0.0771	0.0729
100°F	0.0744	0.0702
150°F	0.0716	0.0675

MATERIALS COMPATIBILITY

Extensive compatibility testing has not been completed. However, it is expected that those materials which are used with askarel transformer fluids will also be compatible with MCS-1865 and MCS-1866. It is recommended that compatibility tests be conducted between the fluids and samples of the specific material to be used under conditions simulative of actual use. A good procedure for such testing is ASTM 3255, Method for Investigating the

Compatibility of Transformer Insulation and Construction Materials
in Askarels.

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0205545

EX P-3163
Page 13 of 25

PCB-ARCH0748739

Monsanto**RAPID-GRAM**

TO (Please Print)

LOCATION

SUBJECT

— J. G. Sparkman

MESSAGE

REPLY

Following is the standard fire resistance disclaimer:

NOTE: materials designated "fire resistant" or "flame retardant" generally are more difficult to ignite, or once ignited burn at a slower rate than corresponding conventional materials. These terms do not mean that fire resistant or flame ~~retardant~~ retardant materials will not burn. However, when properly used, Monsanto's fire resistant or flame retardant products are useful in helping customers meet their fire safety requirements.

0205546

SENDER'S FULL NAME (Please Print)

DATE

SIGNATURE

DATE

Bill ~~xxxx~~ Lubic

8/27/76x

LOCATION

LOCATION

G 1140 REV 12 74

Monsanto

RAPID-GRAM

TO (Please Print)

LOCATION

SUBJECT

R. E. Hatton

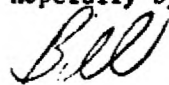
Data Sheets on MCS-1238, -1865 & -1866 Fluids

MESSAGE

REPLY

Attached is the finalized copy on subject
incorporating all the changes made by
our legal counselors.

I've put the data sheets into production
and we should see finished typeset copy
hopefully by the end of the week.



Bill

0205547

SENDER'S FULL NAME (Please Print)

DATE

SIGNATURE

DATE

W. D. Lubic

3/22/76

LOCATION

LOCATION

BINB

G 1140 RIV 1274

DATE March 19, 1976

JOB IC/FF-54 Master Copy

W. D. Lubic

Monsanto (logo)

TECHNICAL DATA SHEET

No. IC/FF-54
(Date: Mo/Yr)

MCS-1238

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PCB-ARCH0748742

In addition, MCS-1238 fluid compared to Aroclor 1016 has much better low temperature characteristics, can be used in metallized paper/film capacitors, is better in DC capacitors and has better high frequency characteristics.

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Put on first page

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- *Fire Resistance Disclaimer (boxed) from p. 12, Legal Guidelines
- Monsanto logo
- MIC Address Line

TYPICAL DATA*

ELECTRICAL PROPERTIES

Dielectric constant at 25°C, 60 Hz (ASTM D924)	6.0
Dielectric constant at 100°C, 60 Hz (ASTM D924)	5.1
Dissipation factor, 100°C, 60 Hz (ASTM D877)	0.046
Resistivity, 100°C, 10^9 ohm cm (ASTM D1169)	1,000

In MCS-1238 impregnated capacitors
(2 microfarad, 585 VAC, 2 layers .66 mil
paper, 0.3% Unox added)

Capacitance at 25°C	1.97
Dissipation factor at 25°C	0.0037
Capacitance at 90°C	1.87
Dissipation factor at 90°C	0.0039

* This data is based upon samples tested in the laboratory and is not guaranteed for all samples.

TYPICAL DATA*

PHYSICAL AND CHEMICAL PROPERTIES

Specific gravity, 25/25°C (ASTM D1810)	1.018
Viscosity, at 100°F (37.8°C) (ASTM D445)	9.1 cs.
Viscosity, at 210°F (98.9°C)	1.98 cs.
Pour Point (ASTM D97)	-60°F (-51°C)
Flash Point (ASTM D92)	303°F (150°C)
Fire Point (ASTM D92)	328°F (165°C)
Autogenous Ignition Temperature (ASTM D2215)	835°F (446°C)
Hydrolysis (NN after 168 hrs. at 210°F with 0.5% H ₂ O and aluminum and steel present)	0.00
Vapor Pressure	95°C 1 torr
	150°C 10 torr
	220°C 100 torr

* This data is based upon samples tested in the laboratory and is not guaranteed for all samples.

SPECIFICATIONS*

CHARACTERISTICS	LIMITS
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Fire Point	320°F Minimum
Moisture	0.005% Maximum
Df 100°C/60 Hz	0.05 Maximum
DK 100°C	5.0 - 5.2

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PCB-ARCH0748744

MATERIALS COMPATIBILITY

MCS-1238 is compatible with all currently used dielectric materials; paper, polypropylene film, paper/film combination, metallized paper and metallized film. It is also generally compatible with other capacitor materials of construction used with Aroclor 1016 chlorinated hydrocarbons. One exception is that two part epoxy sealants should not be used with MCS-1238.

It is recommended that compatibility tests be conducted with the fluid and samples of the specific materials to be used under conditions simulative of actual use. ASTM D3255, Method for Investigating the Compatibility of Transformer Insulation and Construction Materials in Askarels, has been found useful in compatibility testing.

HANDLING PRECAUTIONS

Since MCS-1238 may cause a moderate degree of skin irritation, care should be taken to avoid prolonged or repeated skin contact with this product. Should dermal contact occur, remove contaminant by washing with soap and water. In case of eye contact, flush eyes thoroughly with large amounts of water.

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This product appears to possess no other acute toxicologic

properties which would require special handling other than the good hygiene practices employed with any industrial chemical.

RECOMMENDATIONS FOR USE

An antioxidant and an epoxide scavenger should be used with MCS-1238. Ionol* (2,6-ditertiary butyl para cresol) anti-oxidant is present in the new fluid and 0.01% should be added to the fluid during each purification cycle in the capacitor impregnation process. A convenient method of handling the Ionol is to dissolve the required amount in a small amount of MCS-1238 and add the resulting solution to the batch of fluid.

The suggested sequence of MCS-1238 fluid preparation is similar to that used to Aroclor 1016 chlorinated hydrocarbons; specifically, remove moisture (20 ppm maximum), add epoxide, clay treat, add antioxidant, degas and then use the fluid for impregnation. Conditions for each step are determined by the specific equipment used; therefore, no operating details are listed.

SHIPPING INFORMATION

MCS-1238 is available in standard steel drums and cans. Shipping classification is Plastics Synthetic Liquid NOIBN.

* Trademark of Shell Chemical Company

MCS-1238 labels must contain the following statement:

CAUTION - MAY CAUSE SKIN IRRITATION.

AVOID PROLONGED OR REPEATED CONTACT WITH SKIN.

FIRST AID: IN CASE OF CONTACT, WASH THOROUGHLY WITH WATER.

0205553

DATE March 19, 1976
JOB IC/FF-57 Master Copy
W. D. Lubic

Monsanto (logo)

TECHNICAL DATA SHEET

No. IC/FF-57
(Date: Mo/Yr)

MCS-1865 AND MCS-1866

TRANSFORMER FLUIDS

Fluids for use in liquid-filled transformers should have high dielectric strength, wide operating temperature range, good heat transfer properties, chemical stability and be fire resistant*. MCS-1865 and MCS-1866 were developed to provide such characteristics, and are suggested for evaluation as dielectric fluids for transformers. These fluids have a considerable degree of fire resistance, but are not equivalent to askarels in this ~~general characteristic~~, *particular feature.*

MCS-1865 and MCS-1866 do not contain polychlorinated biphenyl (PCB). Both MCS-1865 and MCS-1866 are synthetic hydrocarbons combined with trichloro³benzene to give the desired viscosity level.

Standard Disclaimer Clause (boxed)

*Fire Resistance Disclaimer (boxed)

Monsanto (logo)

MIC Address Line

0205554

Monsanto
EXP-3163
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Technical data on typical laboratory samples are given below. Additional studies are underway to develop further data. Samples are available for preliminary evaluation.

TYPICAL DATA*

	<u>MCS-1865</u>	<u>MCS-1866</u>
<u>ELECTRICAL PROPERTIES</u>		
Dielectric Strength (ASTM D877) 25°C, 0.1 inch gap	> 50 KV	42.1 KV
Impulse Strength	>120, <160 KV	-
Power Factor, 100°C, 60 Hz (ASTM D924)	0.11%	0.01%
Dielectric Constant, 100°C, 60 Hz (ASTM D924)	2.56	2.74
Gassing Tendency (ASTM D2298)	9.5 ml/min.	41.2, 31.7 ml/min.
<u>FIRE RELATED PROPERTIES</u>		
Flash Point (ASTM D92)	315°F (157°C)	310°F (154°C)
Fire Point (ASTM D92)	None to b.p. (390°F [200°C])	None to b.p. (390°F [200°C])
Auto Ignition Temp., (ASTM D2155)	750°F (399°C)	800°F (427°C)
Oxygen Index	18.3	17.1
<u>PHYSICAL PROPERTIES</u>		
		0205555
Specific Gravity		
@ -30°C	1.027	1.088
-15°C	1.016	1.076
0°C	1.005	1.065
25°C	0.987	1.045
50°C	0.970	1.026
100°C	0.933	0.988
150°C	0.895	0.948

*This data is based upon samples tested in the laboratory **EXP-3463**
not guaranteed for all samples.

	<u>MCS-1865</u>	<u>MCS-1866</u>
Coefficient of Exp., ml/ml, °C	0.000750	0.000761
Viscosity, cs.		
@ -40°C	19,620	-
-30°C	5,119	1830
-15°C	1,040	426
0°C	306	140
25°C	69.5	37
50°C	24.4	14.7
100°C	6.44	4.50
150°C	2.88	2.18
Pour Point (ASTM D97)	-50°F (-45°C)	-50°F (-45°C)
Temperature °C at which Vapor Pressure is:		
1 Torr	58	49
10 Torr	104	96
100 Torr	169	161
760 Torr	248	240
Specific Heat, BTU/lb.		
@ 25°F	0.412	0.390
50°F	0.430	0.406
100°F	0.466	0.438
150°F	0.501	0.470
Thermal Conductivity BTU/ft., hr.		
@ 25°F	0.0785	0.0744
50°F	0.0771	0.0729
100°F	0.0744	0.0702
150°F	0.0716	0.0675

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MATERIALS COMPATIBILITY

Extensive compatibility testing has not been completed. However, it is expected that those materials which are used with askarel transformer fluids will also be compatible with MCS-1865 and MCS-1866. It is recommended that compatibility tests be conducted between the fluids and samples of the specific material to be used under conditions simulative of actual use. A good procedure for such testing is ASTM 3255, Method for Investigating the

Compatibility of Transformer Insulation and Construction Materials
in Askarels.

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0205557

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PCB-ARCH0748751