Fermi National Accelerator Laboratory
Batavia, IL 60510

QQM
MAGNET REWORK/MODIFICATION

Reference Drawing(s):
Magnet Assembly 5520-ME-388120

Project # / Task #: *200/1.1.1.3.2.5*	**Job #:** *191*
Released by: *Matt Cullen*	**Magnet/Device Series:** *QQM*
Date: *4/4/2003 8:28:57 AM*	**Scan Pages:**
Prepared by: M. Cullen, J. Larson	

Title	Signature	Date
TD / E&F Process Engineering	Bob Jensen Bob Jensen / Designee	3/28/03
TD / E&F Assembly	Dan Smith Dan Smith / Designee	4/1/03
TD / E&F Device Design	William Robotham William Robotham / Designee	4/1/03
TD / E&F Fabrication Manager	John Carson John Carson / Designee	4/1/03

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	8/10/00
A	3.1	Hipot Beam tube to core for reference only.		
	3.2	Remove the incoming flow check and move to after Manifold has been modified and re-number	1052	10/17/00
	3.4	Remove the Hydro check		
B	8.3	Update the DSR.	1542	3/28/03

Ensure appropriate memos and specific instructions are placed with the traveler before issuing the sub traveler binder to production.

1.0 General Notes

1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Surgical Latex Gloves (Fermi stock 2250-2494) shall be worn by all personnel when handling all product parts after the parts have been prepared/cleaned.

1.2 All steps that require a sign-off shall include the Technician/Inspectors first initial and full last name.

1.3 No erasures or white out will be permitted to any documentation. All incorrectly entered data shall be corrected by placing a single line through the error, initial and date the error before adding the correct data.

1.4 All Discrepancy Reports issued shall be recorded in the left margin next to the applicable step.

1.5 All personnel performing steps in this traveler must have documented training for this traveler and associated operating procedures.

1.6 Personnel shall perform all tasks in accordance with current applicable ES&H guidelines and those specified within the step.

1.7 Cover the product/assembly with Green Herculite (Fermi stock 1740-0100) when not being serviced or assembled.

2.0 Parts Kit List

2.1 Attach the completed Parts Kit for this production operation to this traveler. Ensure that the serial number on the Parts Kit matches the serial number of this traveler. Verify that the Parts Kit received is complete.

Process Engineering/Designee

4/1/07
Date

3.0 Incoming Inspection

3.1 Perform an electrical check of the coils and record results below.

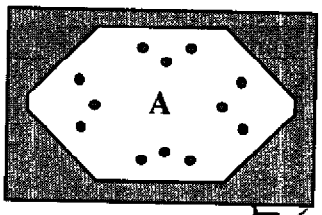
Main Coil Electrical

Electrical Test	Equipment Serial Number	Limit	Actual Measurement	Pass	Fail	Out of Tolerance
Resistance	32-1005	1.5Ω to 1.7Ω	1.57 Ω	✓		
LS @ 1 KHz	84619	700 mH nominal For Reference only	1589 mH			
Q @ 1 KHz		For Reference only	.6			
LS @ 100 Hz		1.3 H nominal For Reference only	1.37 H			
Q @ 100 Hz		For Reference only	10.8			
100 Volt Ring	P62020			✓		
Hipot Coil to Core	AR0504	1500 V @ < 5 μA	.2 μA	✓		
Hipot Coil to Beam Tube		1500 V @ < 5 μA	.1 μA	✓		
Hipot Beam Tube to Core		1500 V Nominal For Reference only	.3 μA			

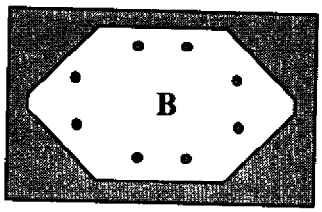
Inspector

4-7-03
Date

3.2 Identify the Cooling System Style and circle below.



12 LCW paths ☑



8 LCW paths ☐

Comments:

Inspector

4-7-03
Date

3.3 Record the old serial numbers.

3G12DM006

FRD 20765

Technician(s)

4-7-03
Date

4.0 Magnet Preparation

4.1 Check if the Manifold is as per the (MD-388120).

☑ **not acceptable, go to step 4.2**
☐ **acceptable, go to step 4.3**

Lead Person _____ Date 4-18-03

4.2 Modify the Manifold as per (MD-388120)

Technician(s) _____ Date 4-18-03

4.3 Perform a Flow Check at a ΔP of 60 PSI and 80 PSI and record the results below.

Magnet Flow Test	Flow Cart Serial Number	Minimum Desired Flow	Actual Measurement	Pass	Fail	Out of Tolerance
ΔP 60 PSI	WPot#3	13 gpm	14.7 Gpm	✓		
ΔP 80 PSI		15 gpm	17.0 Gpm	✓		

Inspector _____ Date 4-21-03

4.4 Perform a hydrostatic check of the water passage at 500 PSI for 30 minutes.

Pass ☑ **Fail** ☐

Inspector _____ Date 4-21-03

4.5 Purge the water passage using house air, until no water is present in the manifold.

Inspector _____ Date 4-21-03

4.6 Mark the Magnet witht the locations for the Pad Construction Balls and Bracket Weldment as per the Assembly Drawing (ME-388547).

Technician(s) _____ Date 4/23/03

4.7 Determine the extent of required Grit Blasting required.

GRIT BLAST ENTIRE MAGNET

Responsible Authority/Physicist _____ Date 4/23/03

4.8 Place the Magnet in the Grit Blast booth.

Technician(s) _____ Date 4/23/03

4.9 Clean off all weld residue in the areas indicated in step 4.6 in order to weld on the Pad Construction Balls and the Bracket Weldment. Grit Blast the Magnet Core as per step 4.7 while protecting the coil ends in accordance with any applicable ES&H Procedures to remove any possible lead based paint.

Note(s):

Cover the manifold using Caplugs (MA-125284) or equivalent.

Technician(s) _____ Date 4/23/03

4.10 Check if the correct Flanges and Bellows are installed and the Beam Tube Assembly is correct as per (MD-388121). Record the dimensions below.

Core Face to the Flange Face (Lead End) ~~7 1/4~~ 7.00

Core Face to the Flange Face (Non-Lead End) 5 3/16

☐ **not acceptable, go to step 4.11**

☑ **acceptable, go to step 4.12**

[signature] 4-23-03

Lead Person Date

4.11 Replace Beam Tube Flanges and Bellows as per (MD-388121).

N/A

Weldor Date

N/A

Technician(s) Date

4.12 Clean the Beam Tube using Isopropyl Alcohol (Fermi stock # 1920-0300) and Lint Free Wipers (Fermi stock # 1660-2600) or equivalent.

[signature] 4/23/03

Technician(s) Date

4.13 Perform a vacuum leak check on the Beam Tube.

PART NO.		SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	DETERMINATION OF MINIMUM DETECTABLE LEAK				
DATE TIME	OPERATOR'S LAST NAME			MDS ÷ ((Response - Bckgnd) ÷ Leak Value) = MDL				
	S24L	20x1	20x1	2	60x5	20x1	3.04E-8	4.02E-10

[signature] 4-21-03

Inspector Date

4.14 Install 2 x 4" Caplug (MA-125282) on the beam tube to protect it from contaminates.

[signature] 4/23/03

Technician(s) Date

5.0 Magnet Rework

5.1 Position the Pad - Construction Balls (MA-331978) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Technician(s) _____ Date 4-24-03

5.2 Verify the position of the Pad - Construction Balls (MA-331978) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Inspector _____ Date 4-24-03

5.3 Weld the Pad - Construction Balls (MA-331978) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Welder _____ Date 4/24/03

Technician(s) _____ Date 4-24-03

5.4 Clean the Weld with a Steel Brush.

Technician(s) _____ Date 4-24-03

5.5 Position the Bracket Weldment (MB-388122) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Technician(s) _____ Date 4-24-03

5.6 Verify the position of the Bracket Weldment (MB-388122) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Inspector _____ Date 4-24-03

5.7 Weld the Bracket Weldment (MB-388122) (Qty. 4) on the magnet as per the 3Q120M Quadrupole Rework Assembly (ME-388120).

Welder _____ Date 4/24/03

Technician(s) _____ Date 4-24-03

5.8 Clean the Weld with a Steel Brush.

Technician(s) _____ Date 4-24-03

6.0 Magnet Preparation

6.1 Vacuum the magnet.

J Schmitt
Technician(s)

4-25-03
Date

6.2 Paint the core and support plates (not the End Holes) of the magnet with Primer.

J Schmitt
Technician(s)

4-25-03
Date

6.3 Paint the core and support plates (not the End Holes) of the magnet with Orange Enamel (MA-351017).

J Schmitt
Technician(s)

4-25-03
Date

6.4 Paint the End Holes in the Support Plate Assembly with Krylon Spray (Fermi stock # 1825-0500) as per the assembly drawing.

J Schmitt
Technician(s)

4-25-03
Date

6.5 Paint the Coil Ends of the Magnet with White Epoxy Paint (Resin MA-274444 and Catalyst MA-274445).

Pat
Technician(s)

5-1-03
Date

6.6 Weigh the magnet using an under a hook scale or equivalent.

Scale Model/Type	Scale Serial Number	Magnet Weight (Lbs.)
MSI 4260	13700/16797	8,030

Junior Jones
Technician(s)

5-2-03
Date

7.0 Final Inspection

7.1 Perform an electrical check of the magnet.

Main Coil Electrical

Electrical Test	Equipment Serial Number	Limit	Actual Measurement	Pass	Fail	Out of Tolerance
Resistance	32-1005	1.5Ω to 1.7Ω	1.58 Ω	✓		
LS @ 1 KHz	846F1	700 mH nominal For Reference only	1559 mH			
Q @ 1 KHz		For Reference only	.6			
LS @ 100 Hz		1.5 H nominal For Reference only	1.37 H			
Q @ 100 Hz		For Reference only	10.8			
100 Volt Ring	P62020			✓		
Hipot Coil to Core	A2050	1500 V @ < 5 μA	.2 μA	✓		
Hipot Coil to Beam Tube		1500 V @ < 5 μA	.1 μA	✓		
Hipot Beam Tube to Core		1500 V Nominal For Reference Only	.3 μA			

D. Coe
Inspector

5-2-03
Date

7.2 Stencil the serial number and weight (Lbs.) in 1" characters centered on both sides of the magnet and on both ends as per the 3Q120M Magnet Rework Modification Assembly (ME-388077) using White Enamel Paint (MA-331911).

both sides (1")

QQMXXX-1
3Q120M
FRD-XXXXX
WEIGHT 8100 LBS

Lead and Return End (1/2")

QQMXXX-1
FRD-XXXXX

Technician(s)

5/2/03
Date

7.3 Affix the completed Generic Magnet Identification Labels (MA-318490) (Qty. 2) on the magnet as per the 3Q120M Magnet Rework Modification Assembly (ME-388120). Affix a completed Generic Magnet Identification Label (MA-318490) to this page.

Fermi National Accelerator Laboratory
Technical Division

QQM 3Q120 Quadrupole Magnet

Serial No: QQM012-0 **Drawing No:** ME-388120 **Magnet Weight:** 8,100 Lbs

DC Resistance:	1.58 Ω	HiPot Coil To Core @ 1500VDC	.2 μA
Ls @ 1kHz:	1.559 H	HiPot Coil To BT @ 1500VDC	.1 μA
Q @ 1kHz:	.6	HiPot BT To Core @ 1500VDC	.3 μA
Ls @ 100Hz:	1.370 H	Water Flow @ 60 PSID	14.7 GPM
Q @ 100Hz:	10.8	Water Flow @ 100 PSID	17.0 GPM
		Hydro @ 500 PSIG for	30 Min

Previous Serial No(s): FRD20765, 3Q120M 006

Remarks: None. **Date Completed:** 5/5/2003

Inspector

5-5-03
Date

7.4 Update DSR Keywords (Location, Location Verified Date & Status) and make entry regarding work preformed. If new Magnet series, Update Magnet Series and Serial Number also. If the Process is a defined Rework Modification, update that field also.

Lead Person

6-4-03
Date

8.0 Production Complete

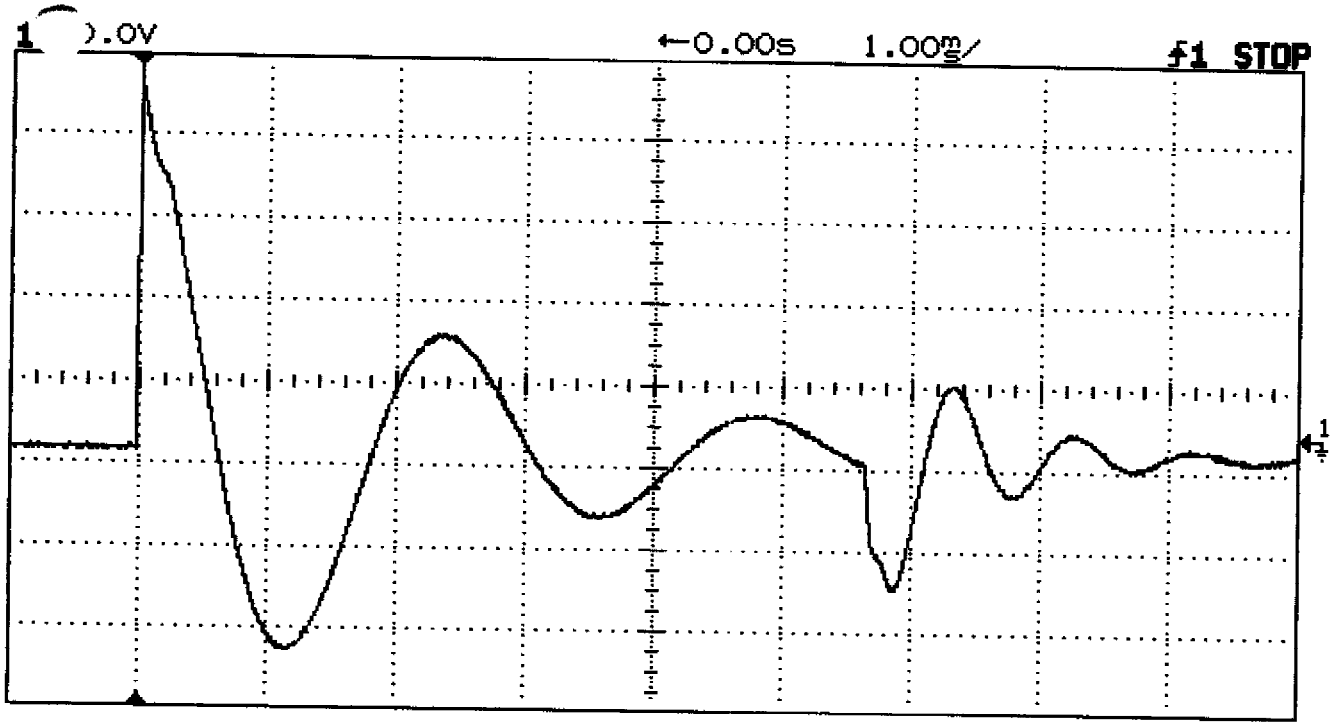
8.1 Process Engineering verify that the Traveler is accurate and complete. This shall include a review of all steps to ensure that all operations have been completed and signed off. Ensure that all Discrepancy Reports, Nonconformance Reports, Repair/Rework Forms, Deviation Index and dispositions have been reviewed by the Responsible Authority for conformance before being approved.

Comments:

_____
_____
_____
_____
_____
_____
_____
_____

_____ _____
Process Engineering/Designee Date

08:17:48 Mon Apr 7, 2003



	State	Volts/Div	Position	Cplg	BW Lim	Inv	Probe
C n 1	On	20.00 V	-11.25 V	DC	Off	Off	10:1
Chan 2	Off	100.0mV	0.000 V	DC	Off	Off	1:1

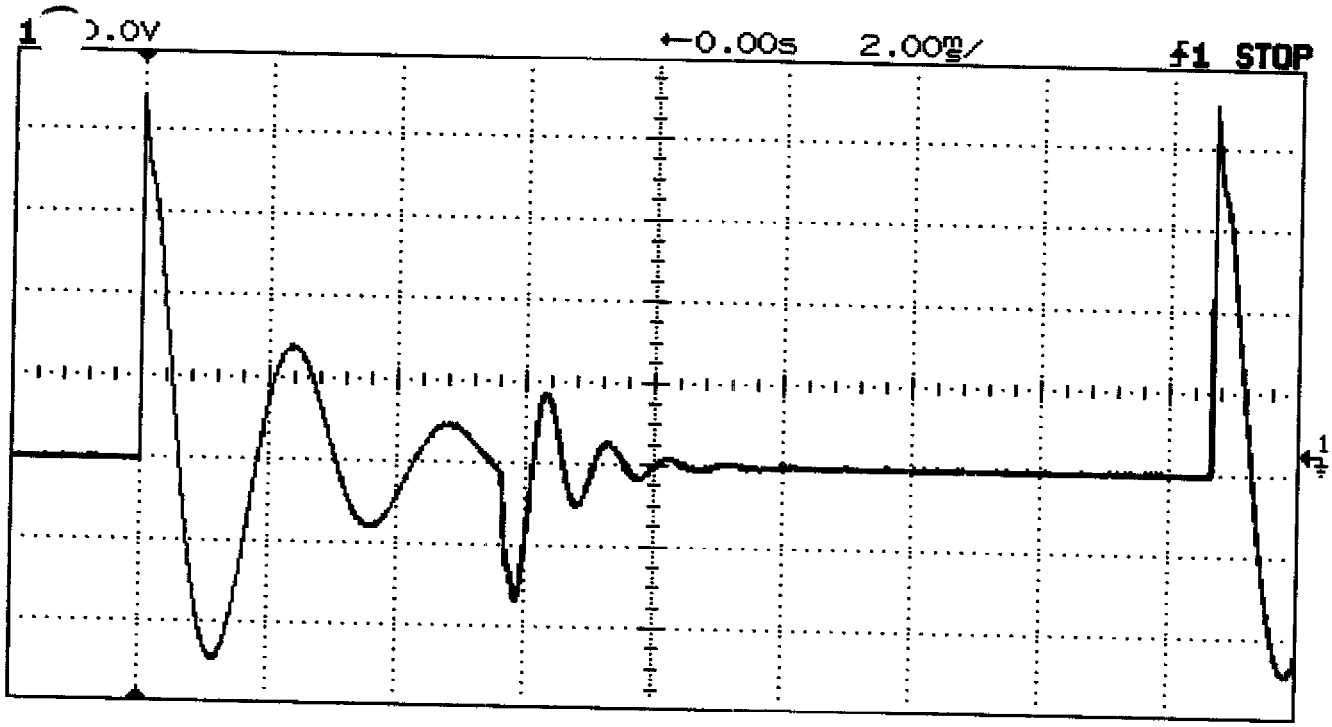
	Mode	Main Time/Div	Main Delay	Time Ref	Delayed Time/Div	Delayed Delay
Horizontal	Normal	1.000ms/	0.000 s	Left	--------	-----

Trigger	Mode	Source	Level	Holdoff	Slope	Couplg	Reject	NoiseRej
	Normal	Ch 1	16.87 V	200.0ns	Pos	DC	HF	On

Display Mode: Normal

Traveler	333588
Step #	3.1
Magnet Serial Number	QQ M012-0
Technician	J. S 2&L
Page Count	1 of 1

10:19:33 Fri May 2, 2003



	State	Volts/Div	Position	Cplg	BW Lim	Inv	Probe
Chan 1	On	20.00 V	-15.00 V	DC	Off	Off	10:1
Chan 2	Off	100.0mV	0.000 V	DC	Off	Off	1:1

	Mode	Main Time/Div	Main Delay	Time Ref	Delayed Time/Div	Delayed Delay
Horizontal	Normal	2.000ms/	0.000 s	Left	--------	-----

Trigger	Mode	Source	Level	Holdoff	Slope	Couplg	Reject	NoiseRej
	Normal	Ch 1	17.50 V	200.0ns	Pos	DC	HF	On

Display Mode: Normal

Traveler	333588 R-B
Step #	7.1
Magnet Serial Number	QQM012-0
Technician	DGa
Page Count	1 of 1

Rev. 8/21/98 by TJG

ORIGINAL

TD/ENGINEERING & FABRICATION

PARTS KIT REQUEST

IMPORTANT NOTES:
1) MAGNET NUMBER MUST BE FILLED IN.
2) ONLY ONE FORM PER MAGNET.
3) PARTS COORDINATOR OR DESIGNEE MUST SIGN THIS FORM.
4) MATERIAL CONTROL WILL ISSUE PARTS AND RECORD ROUTING NUMBER.
5) ANY QUANTITIES NOT AVAILABLE WILL HAVE COMMENTS RETURNED TO THE PARTS COORDINATOR FOR REVIEW.

RELEASED BY

MAGNET NUMBER: QQM012

PRODUCTION SIGNATURE: M Cullen 13134

TODAYS DATE: 10-Apr-03

NEED DATE: 11-Apr-03

DELIVER TO _____ IB2

Budget Code: YAK
Project #/ Task#: 200/1.1.1.3.2.5

ISSUE VERIFICATION

MATERIAL CONTROL SIGNATURE: [signature]

DATE ISSUED TO STOCKROOM: 4/10/03

THIS KIT LIST IS FOR

388120	*	3Q120 Magnet Rework QQM / QQN

PART NUMBER	REV	DESCRIPTION	REQUIRED QTY/ASS'Y	MATERIAL CONTROL: QTY FILLED OUT BY STOCK ROOM: ISSUED	ROUTE FORM	NOT AVAIL	FILLED OUT BY EXPEDITER: DATE AVAIL	COMMENTS TO PRODUCTION MANAGER	PROD VERIFY PART	SUPT. VERIFY PART
331978		Pad- Construction Ball	~~1~~ 0 EA	0	—		—			
388122		Support Foot	~~1~~ 3 EA	3	79474		4/10/03			

RETURN THIS COMPLETED PARTS KIT REQUEST WITH THE ISSUED PARTS TO THE PARTS COORDINATOR.

[signature] 4/11/03 : STOCKROOM SIGNATURE AND DATE

TRAVELER NO. TR-333588

KIT IS COMPLETE (PARTS COORDINATOR SIGNATURE): _____ BADGE # 13134

DATE 4/11/03