OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: Ti 7 HT# CN2775 Washers & Hardware (small)

Torque Screwdriver: True Craft 75 In-lbs SN: 694000691
Cal: 7/25/06 Due: 7/25/07

Initial Weight: 23.09710g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 23.09751g **Cal:** 5/9/06 **Due:** 11/9/06

SOLUTION: 4 m NaCl
467.54g NaCl Lot# 054171
+ DI To 2000mls

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/5/06 **Due:** 1/5/07

Initial pH: 6.84 **Model:** Orion **SN:** 2330
Final pH: 7.08 **CAL:** 7/6/06 **DUE:** 7/6/07
pH Probe: #13-620-296 **SN:** 5003095

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** H98-182
Cal: 5/11/06 **Due:** 5/11/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE **SN:** 3329075

Gas: ~~99.999% Nitrogen~~ 3/10 11/7/06 Zero Air

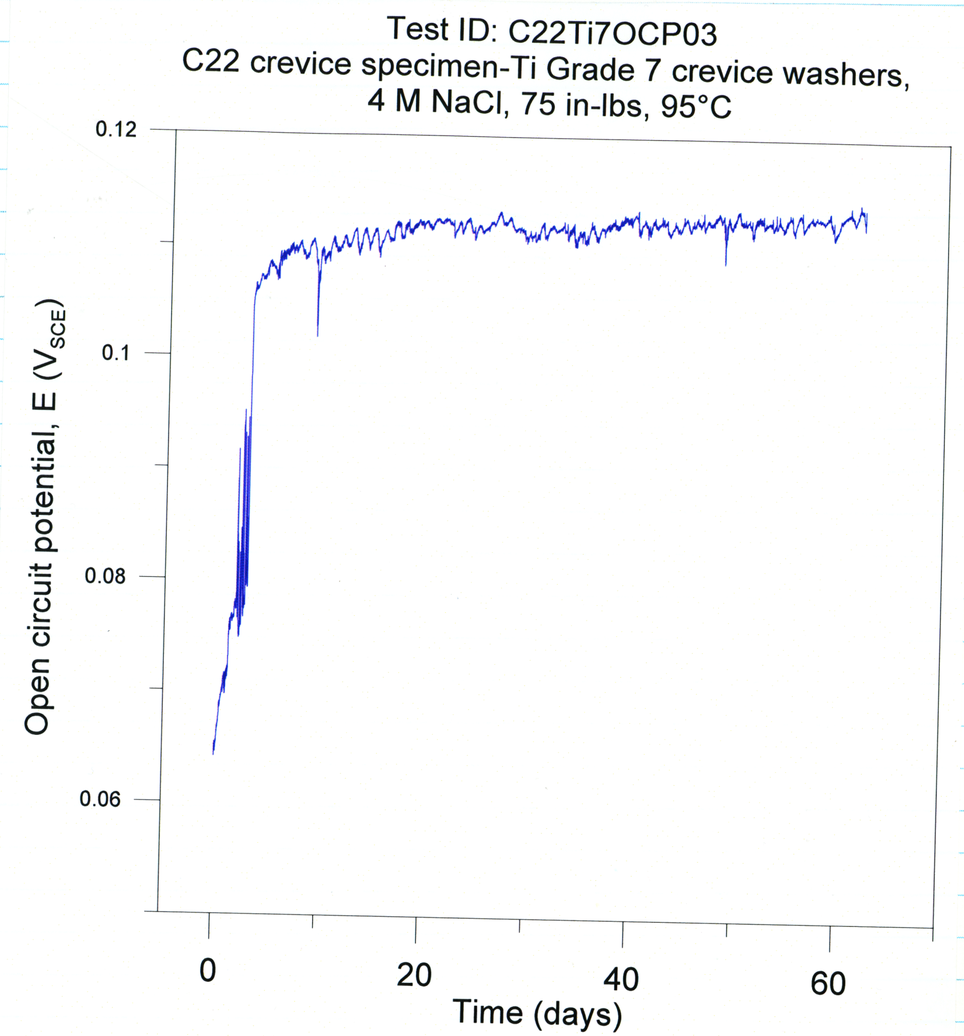
Ecorr: −190 mV Vs SCE **Model:** Keithley 614 **SN:** 0704934
Ept: +265 mV Vs SCE **Cal:** 6/6/06 **Due:** 6/6/07

Potentiostat: Solartron 1480 **SN#** 00240551 cal 11/7/06 Due 5/7/07
Test ID: C22Ti7OCP03

Specimen Examination: Started 11/7/06 Ended 1/8/07
No Crevice Corrosion - Dull Tint Staining on All Surfaces
No Corrosion on Ti 7 washers And Hardware

Data files: OCPC22Ti71107-Un1ch2, OCPC22Ti71114, OCPC22Ti71121, OCPC22Ti71128, 1205, 1212, 1219, 1226, 1_207, 1_0907

[signature] 11/7/06



[signature] 1/11/07

XH 3/25/08

Galvanic Corrosion Test

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C-22 HT#2277-3-3266 Specimen Base Alloy

C-22 HT# 2277-3-3266 Plate

C-22 HT#2277-3-3266 Crevice Washers/Hardware

Torque Screwdriver: Tech Craft 75 In-lbs **Cal:** 7/25/06 **SN:** 694000691 **Due:** 7/25/07

Initial Weight: ~~No 23.09710g~~ Bag 11/7/06 23.75540g

Final Weight: 23.75313g

Model: Sartorius Genius **Cal:** 5/9/06 **SN:** 12809099 **Due** 11/9/06

SOLUTION:

4 m $CaCl_2 \cdot 2H_2O$
1176.16g $CaCl_2 \cdot 2H_2O$ Lot# 061720
+ DI To 2000 mls

Reagents measured with

Model: OHAUS **Cal:** 7/5/06 **SN:** 2883 **Due:** 1/5/07

Initial pH: 3.84
Final pH: 3.54

Model: Orion EA 940 **Cal:** 7/6/06 **pH Probe:** #13-620-296 **SN:**2330 **Due:** 7/6/07 **SN:** 5003095

TEST TEMPERATURE: 95°C **Thermometer:** Fisher **Cal:** 6/1/06 **SN:** 4418 **Due:** 6/1/07

Reference Electrode: Fisher SCE **# 13-620-52** **SN:** 3300328

GAS: Zero Air

(CREVICE)
Ecorr: -375 **mV vs SCE**

(PLATE)
Ecorr: -334 **mV vs SCE**

Model: Keithley 614 **Cal:** 6/6/06 **SN#:** 0704934 **Due:** 6/6/07

Potentiostat:Solartron 1480 **sn#** 00240551 cal: 11/7/06 Due: 5/7/07

TEST ID: MA22CaCl2C X.H 2/28/07

DATA FILES: C22Cacl21107I - Un1Ch5, C22Cacl21107E - Un1Ch6, 1114, 1121, 1128, 1205, 1211, 1212, 1219, 1226, 0102, 0109, 0116, 0123, 0130, 0206, 0213

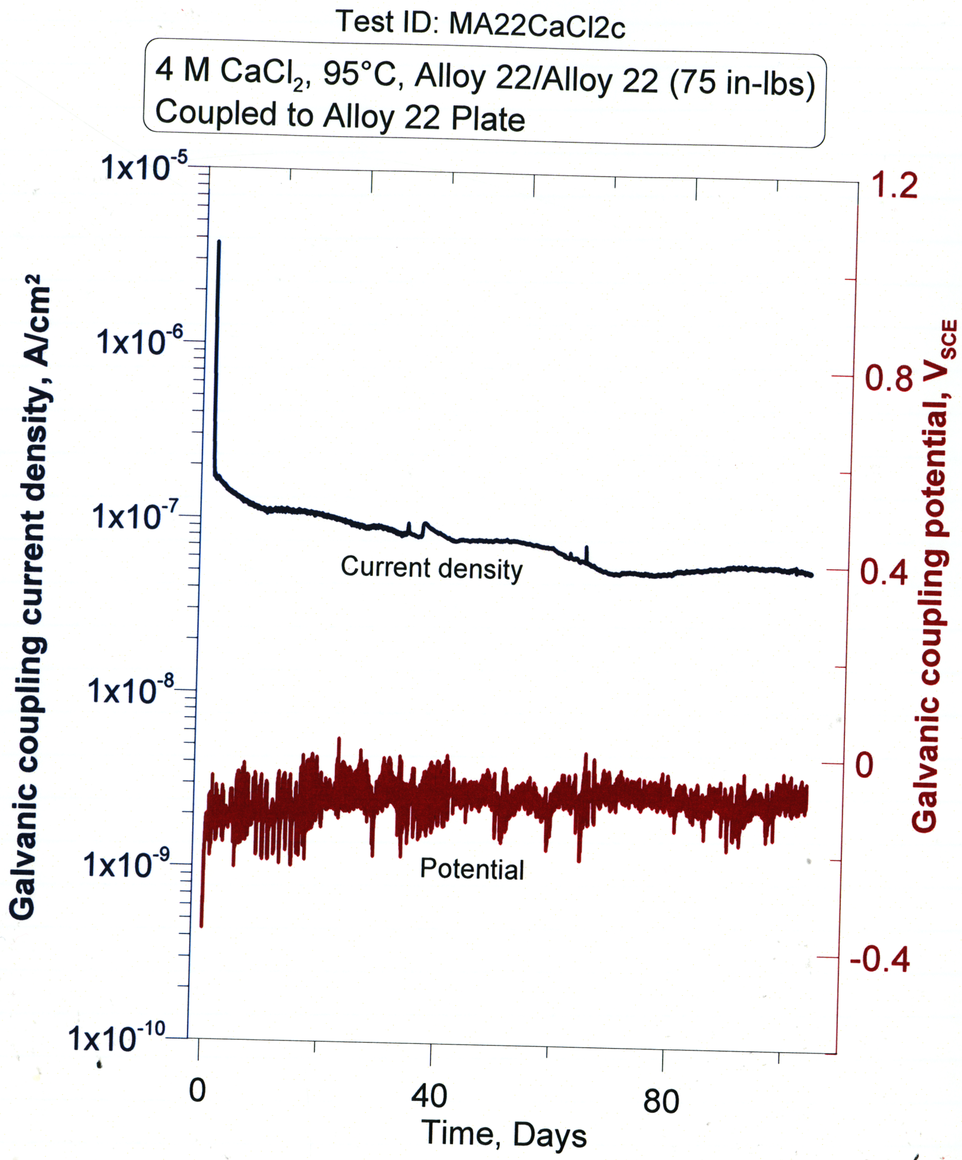
Specimen Examination: Started 11/7/06 Ended 2/19/07 Total time: 8.9×10^6 s = 103.7 days

Crevice Corrosion 1/4 feet of C-22 Crevice Washers - 3 other sites Appear to have Surface Etching? or could be Related to the Torque of 75 In lbs

C-22 Crevice Washers Have Corrosion on one Side - Etching on outside of other C-22 Crevice Washer Between Nut and outside of Washer

C-22 Plate No Corrosion - mild surface staining on All Material

11/7/06



Xihua He
3/2/07

Penetration depth: 212 μm on crevice specimen
108 μm on washer
Measured with Olympus metallurgical microscope PMG3
Cal: 12/21/06 Due: 6/21/07

Xihua He
3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: Ti 7 HT# CN2775 Crevice Washers And Hardware Small

Torque Screwdriver: Tove Craft 75 In-lbs SN: 699000691
Cal: 7/25/06 Due: 7/25/07

Initial Weight: 23.73207g **Model:** Sartorius Genius SN: 12809099
Final Weight: 23.73198g Cal: 5/9/06 Due: 11/9/06

SOLUTION: 4 M NaCl
467.56g NaCl Lot# 054N1
+DI To 2000mls

Reagents measured with **Model:** OHAUS SN: 2883
Cal: 7/5/06 Due: 1/5/07

Initial pH: 8.82 **Model:** Orion SN: 2330
Final pH: 7.36 CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 5063095

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** M98-179
Cal: 5/11/06 Due: 5/11/07

Counter Electrode: Platinum Flag

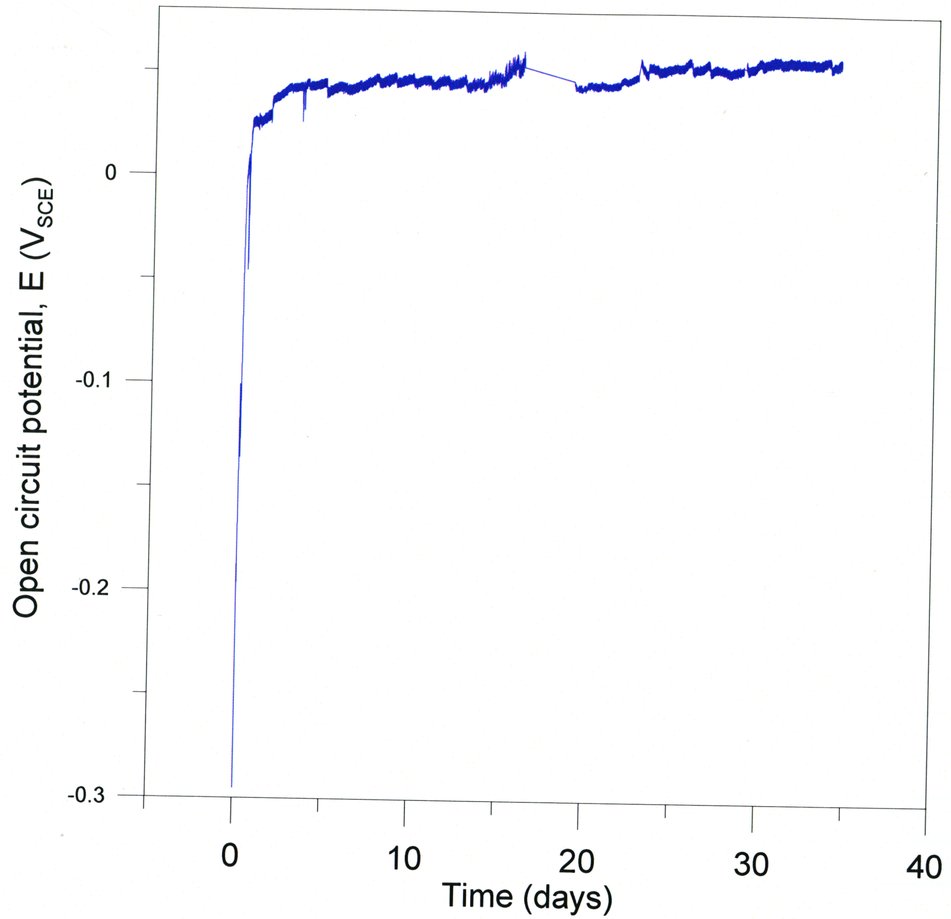
Reference Electrode: Fisher SCE SN: 3328225
Zero 11/8/06
Gas: ~~99.999% Nitrogen~~ Zero Air
Ecorr: -312 mV Vs SCE **Model:** Keithley 614 SN: 0704934
Ept: +213 mV Vs SCE Cal: 6/6/06 Due: 6/6/07

Potentiostat: Solartron 1480 SN# 00240053 cal: 8/23/06
Test ID: C22Ti7ocp04 Due: 2/23/07

Specimen Examination: Started 11/8/06

No Crevice Corrosion on C-22 Specimen
No Corrosion on Ti 7 Crevice Washers or Hardware
Mild Blue tint staining on Specimen - Dull Tint staining on Ti 7 Material

11/8/06



11/11/06

X.rl 3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: C-22 HT#2277-3-3266 Crevice Washers And Hardware (Large)

Torque Screwdriver: True Craft 75 In-lbs SN: 694000691
Cal: 7/25/06 Due: 7/25/07

Initial Weight: 23.47410g
Final Weight: 23.47341g
Model: Sartorius Genius SN: 12809099
Cal: 11/8/06 Due: 5/8/07

SOLUTION: 4.0 m NaCl
467.56g NaCl Lot# 05417
+ DI To 2000mls

Reagents measured with Model: OHAUS SN: 2883
Cal: 1/2/07 Due: 7/2/07

Initial pH: 6.79
Final pH: 6.53
Model: Orion SN: 2330
CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

TEST TEMPERATURE: 95°C
Measured with Hg Thermometer SN: 4279
Cal: 6/1/06 Due: 6/1/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE SN: 8131157

Gas: Zero Air
Ecorr: -320 mV vs SCE
Ept: +240 mV vs SCE
Model: Keithley 614 SN: 0704936
Cal: 5/17/06 Due: 5/17/07

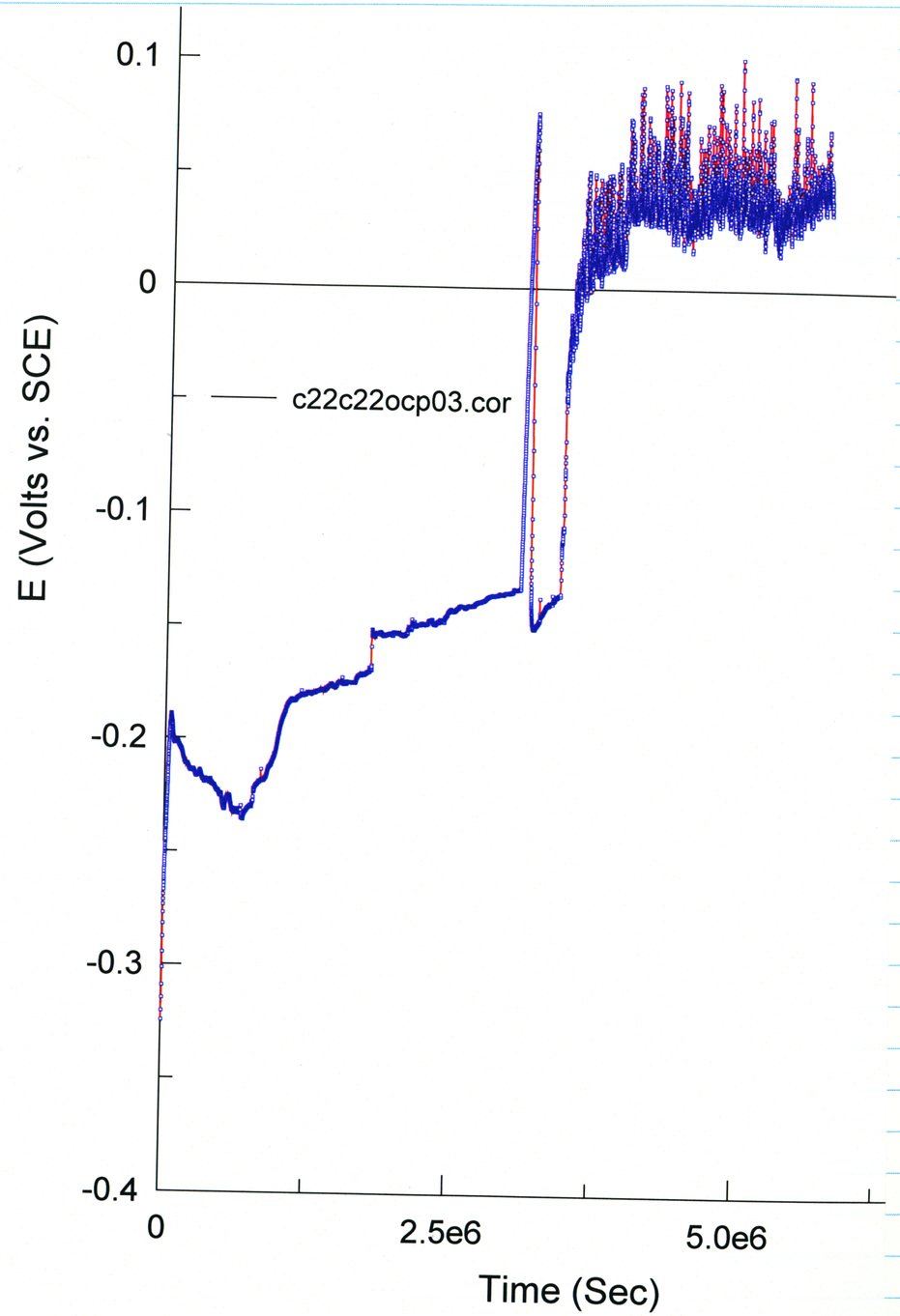
Potentiostat: Solartron 1480 SN# 00240551
Test ID: C22C22OCP03 Cal: 11/7/06 Due: 5/7/07

Specimen Examination: Stantco 1/8/07 — 3/16/07
File names: OCPC22C220108#3-Un1Ch3, (end)
Test time: 66.7 days 0115, 0122, 0129, 0205, 0212, 0219, 0220, 0222, 0226, 0305, 0312

Crevice Corrosion on 1/24 feet of C-22 Crevice Washers
No Corrosion on Washer Side Just To the C-22 Specimen
Mild Surface Staining on All Surfaces of Specimen
And Crevice Washers

X.H. 5/15/07

[signature] 1/8/07



Xihua He 3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: Ti 7 Ht# CN 2775 Crevice washers And Hardware (Large)

Torque Screwdriver: True Craft 75 In-lbs
Cal: 7/25/06
SN: 694000691
Due: 7/25/07

Initial Weight: 23.58998g
Final Weight: 23.59031g
Model: Sartorius Genius
Cal: 11/8/06
SN: 12809099
Due: 5/8/07

SOLUTION: 4.0 m NaCl
467.54g NaCl Lot# 05417
+ DI To 2000mls

Reagents measured with
Model: OHAUS
Cal: 1/2/07
SN: 2883
Due: 7/2/07

Initial pH: 7.39
Final pH: 7.57
Model: Orion
CAL: 7/6/06
pH Probe: #13-620-296
SN: 2330
DUE: 7/6/07
SN: 4065196

TEST TEMPERATURE: 95°C
Y.H. 6/5/07
Measured with Hg Thermometer SN: 5283
Cal: 6/27/06
Due: 6/27/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE
SN: 0066119

Gas: Zero Air
Ecorr: -81mV Vs SCE
Ept: +233mV Vs SCE
Model: Keithley 614
Cal: 5/17/06
SN: 0704936
Due: 5/17/07

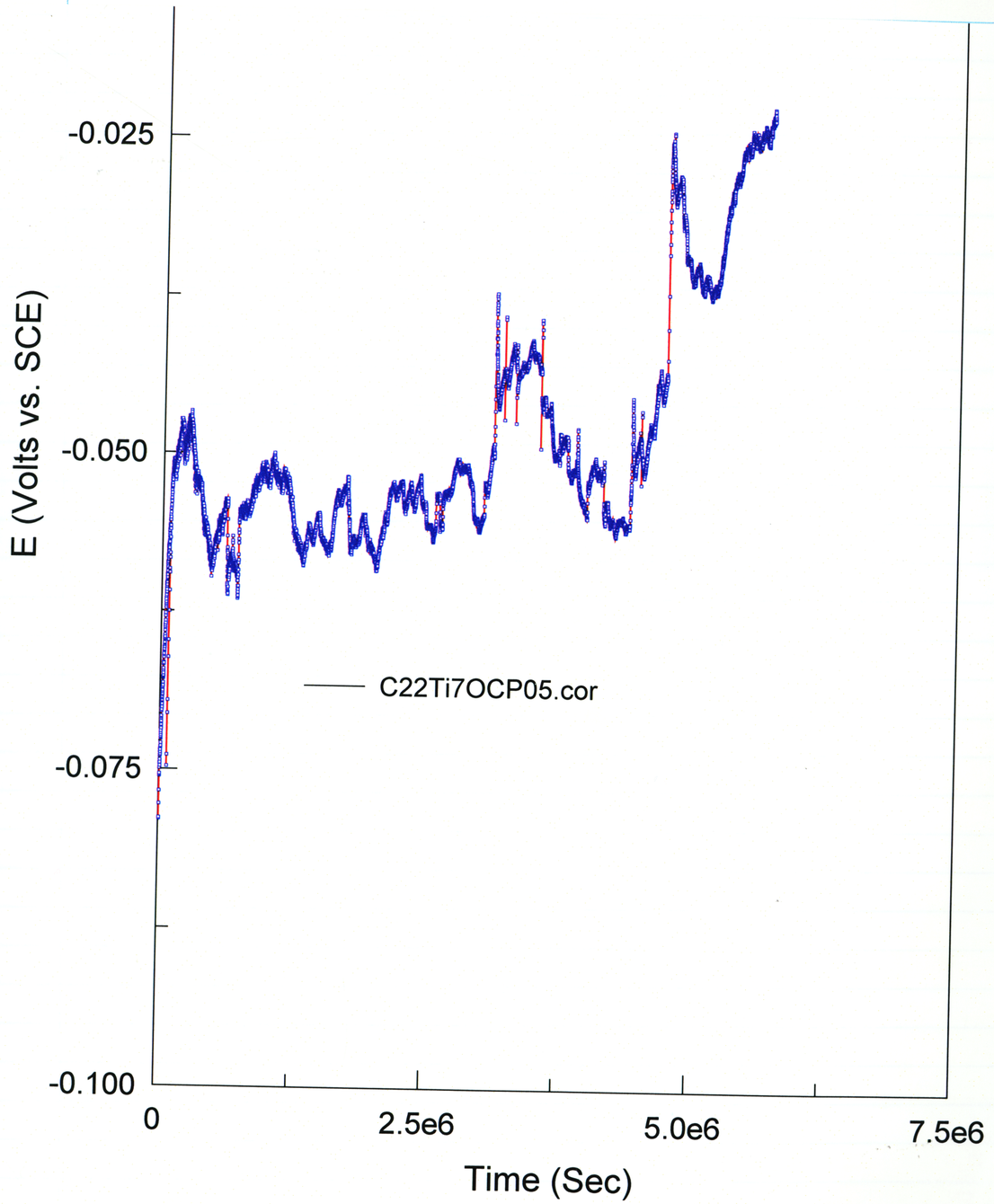
Potentiostat: Solartron 1480
SN# 00240551
Cal: 11/7/06
Due: 5/7/07

Test ID: C22Ti7OCP05

Specimen Examination: started 1/8/07 — 3/16/07 end

No Corrosion 0/24 feet of Ti 7 Crevice Washers
Some Surface Scratches And Compresion Marks on C-22 Surface from the 75 In lb Torque
Dull Tint Staining on C-22 Specimen And Ti 7 Material

[signature] 1/8/07



Xichuan He 3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: Ti 7 HT# CN 2775 Crevice Washers And Hardware (Lg)

Torque Screwdriver: True Craft 75 In-lbs SN: 694000691
Cal: 7/25/06 Due: 7/25/07

Initial Weight: 23.46387g
Final Weight: 23.46363g
Model: Sartorius Genius SN: 12809099
Cal: 11/8/06 Due: 5/8/07

SOLUTION: SCW - Simulated Concentrated Water + DI water to 2000 mls
KCl: 12.963g Lot# 043820
NaCl = 10.865g Lot# 054171
$NaNO_3$ = 17.502g Lot# 050093
Na_2SO_4 = 41.41g Lot# 035461
$NaHCO_3$ = 192.69g Lot# 054010
NaF = 6.191g Lot# 006679

Reagents measured with **Model:** OHAUS SN: 2883
Cal: 1/2/07 Due: 7/2/07

Initial pH: 7.96
Final pH: 10.45
Model: Orion SN: 2330
CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

Adjusted pH To 10.3 with 10 m NaOH Lot# 037972

TEST TEMPERATURE: 95°c
Measured with Hg Thermometer SN: H98-162
Cal: 4/7/06 Due: 4/6/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 SN: 4028031

Gas: Zero Air
Ecorr: -767 Vs SCE
Ept: -71 Vs SCE
Model: Keithley 614 SN: 0704936
Cal: 5/17/06 Due: 5/17/07

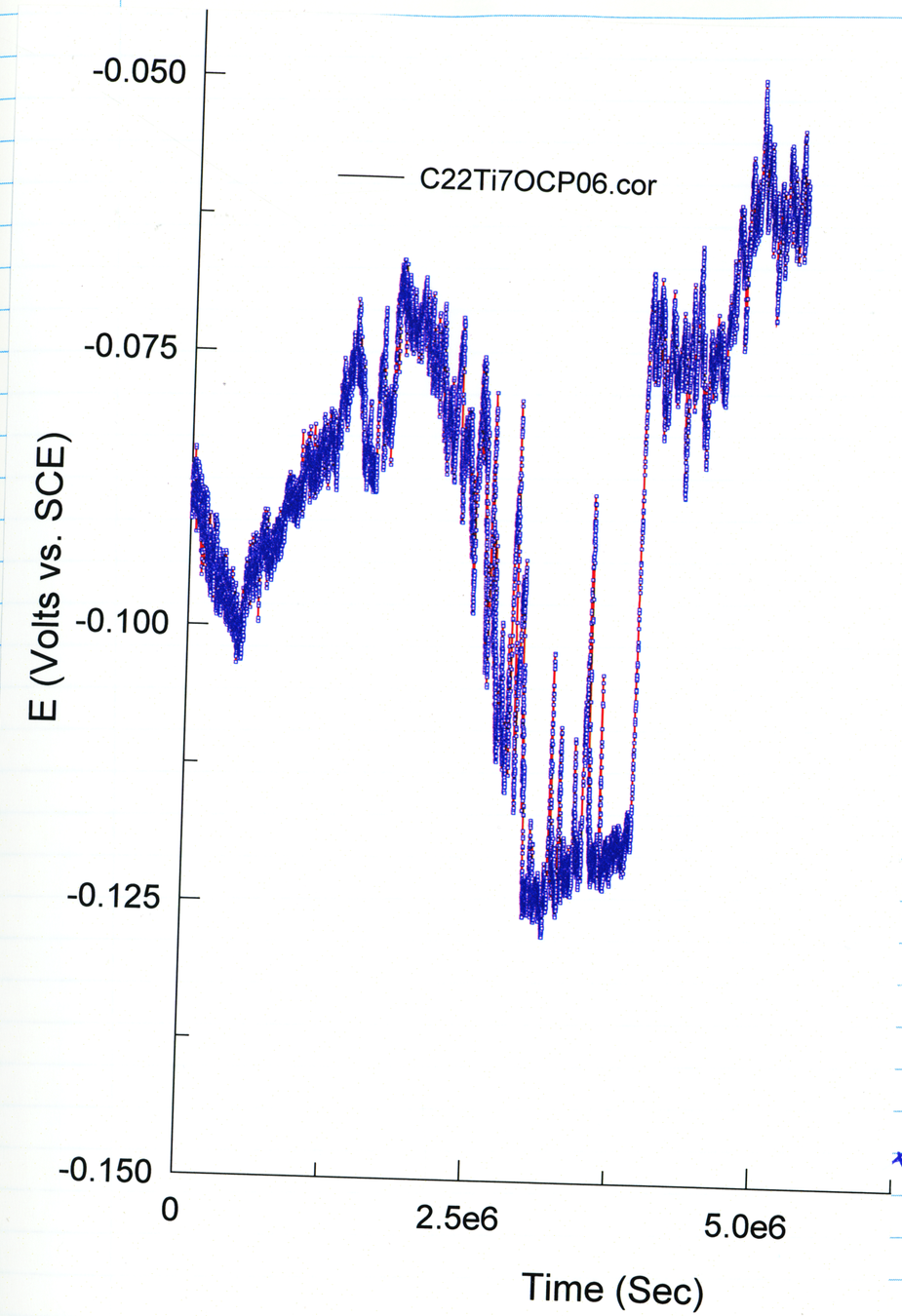
Potentiostat: Solartron 1480 SN# 00238265
Cal: 9/11/06 Due: 3/11/07
Test ID: C22Ti7OCP06

Specimen Examination: Test time: 61.6 days X.H 3/26/07

No Corrosion on C-22 Specimen or Ti 7 Crevice Washers
Dull Tint film looking stain on All Surfaces of C-22 specimen And Ti 7 material

* will Repolish Specimen for further Testing

[signature] 1/10/07



~~Xi'hwen He 1/11/07~~
Xi'hwen He
3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: C-22 HT# 2277-3-3266 Crevice Washers And Hardware (Large)

Torque Screwdriver: True Craft 75 In-lbs Cal: 7/25/06 SN: 694000 691 Due: 7/25/07

Initial Weight: 23.55392 g
Final Weight: 23.55587 g
Model: Sartorius Genius Cal: 11/8/06 SN: 12809099 Due: 5/8/07

SOLUTION: SCW - Simulated Concentrated H_2O TDI To 2000mls
KCl = 12.962 Lot# 043820 Na_2SO_4 = 41.39 Lot# 035461
NaCl = 10.866 Lot# 054171 $NaHCO_3$ = 192.70 Lot# 054010
$NaNO_3$ = 17.508 Lot# 050093 NaF = 6.190 Lot# 006679

Reagents measured with Model: OHAUS Cal: 1/2/07 SN: 2883 Due: 7/2/07

Initial pH: 7.76
Final pH: 10.19
Model: Orion CAL: 7/6/06 SN: 2330 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

Adjusted pH To 10.27 with 10 m NaOH Lot# 033972 Used 33.5 mls

TEST TEMPERATURE: Measured with Hg Thermometer SN: E98-191 Cal: 11/28/07 Due: 5/28/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 SN: 9252105

Gas: Zero Air
Ecorr: -485 Vs SCE
Ept: -227 Vs SCE
Model: Keithley 614 Cal: 5/17/06 SN: 0704936 Due: 5/17/07

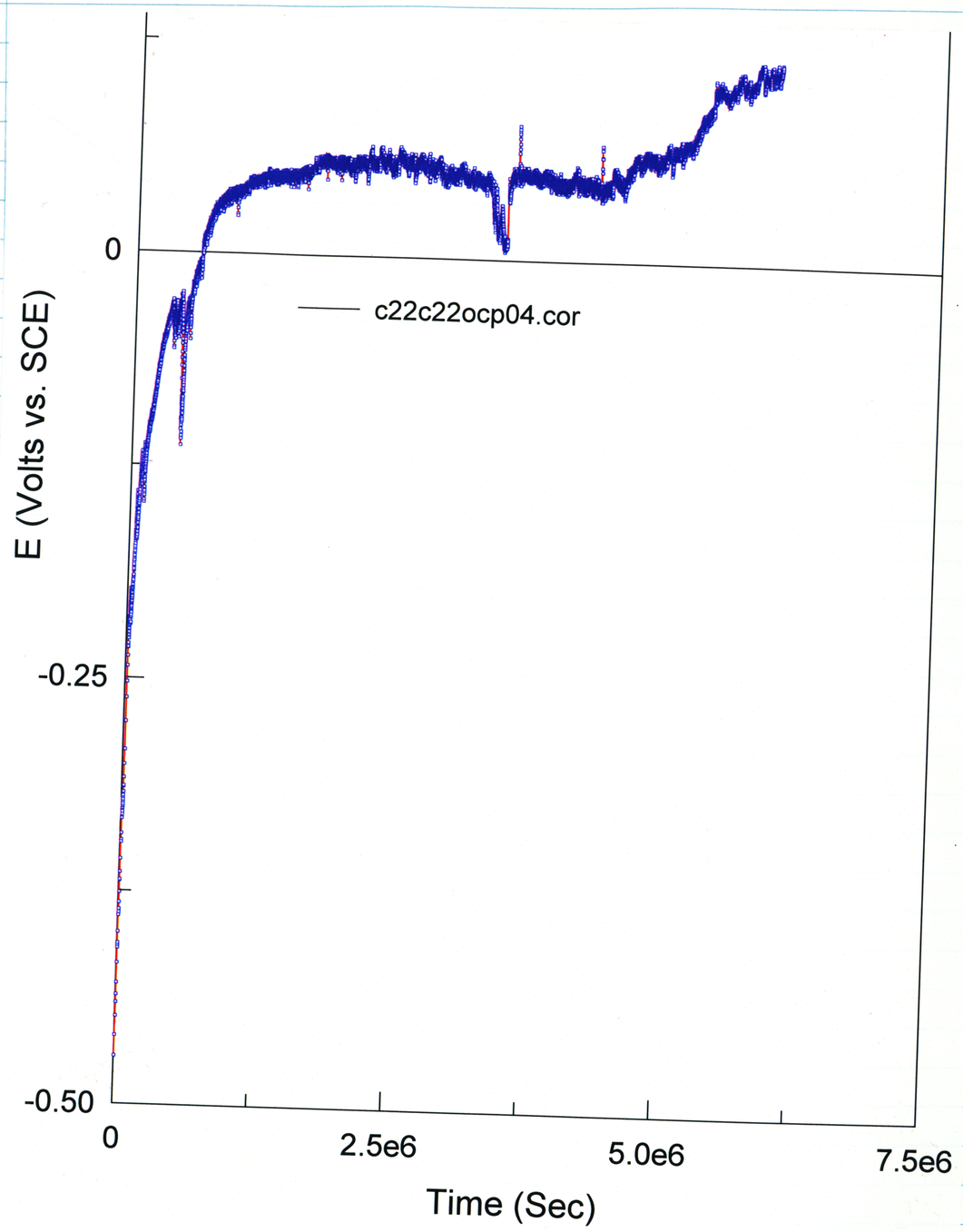
Test time: 69.0 days end on 3/21/07 X.H 3/26/07

Potentiostat: Solartron 1480 SN# 00238265
Test ID: ~~C22T17~~ C22C22OCP04 X.H 1/11/07 Cal: 9/11/06 Due: 3/11/07

Specimen Examination: No Crevice Corrosion on C-22 Specimen or C-22 Crevice Hardware - Dull Tint surface Staining looks like A film Coating.

* Note: will Repolish Specimen for Further Testing

[signature] 1/10/07



Xi'hua He 3/26/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: C-22 HT# 2277-3-3266 Crevice Washers & Hardware (Small)

Torque Screwdriver: True Craft 75 In-lbs
Cal: 7/25/06
SN: 694000691
Due: 7/25/07

Initial Weight: 23.53727 g
Final Weight: 23.53604 g
Model: Sartorius Genius
Cal: 11/8/06
SN: 12809099
Due: 5/8/07

SOLUTION: 4.0 m NaCl
467.53 g NaCl Lot# 05417
+ DI To 2000 mls

Reagents measured with
Model: OHAUS
Cal: 1/2/07
SN: 2883
Due: 7/2/07

Initial pH: 6.53
Final pH: 6.93
Model: Orion
CAL: 7/6/06
pH Probe: #13-620-296
SN: 2330
DUE: 7/6/07
SN: 4065196

TEST TEMPERATURE: 95°C
Measured with Hg Thermometer SN: C98-132
Cal: 9/13/06
Due: 9/13/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE
SN: 4028035

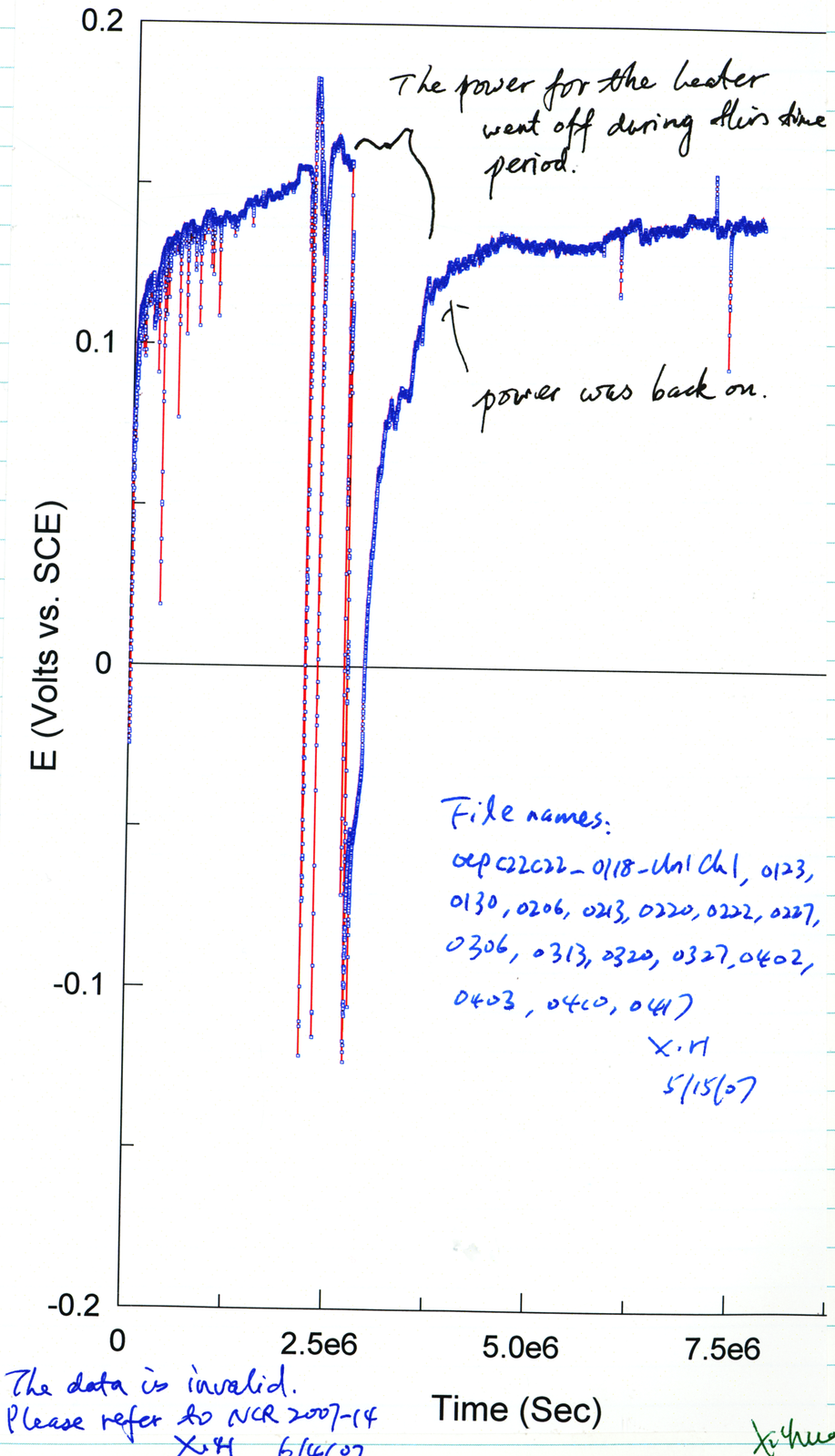
Gas: Zero Air
Ecorr: -332 mV Vs SCE
Ept: +265 mV Vs SCE
Model: Keithley 614
Cal: 5/17/06
SN: 0704936
Due: 5/17/07

Potentiostat: Solartron 1480
SN# 00240551
Cal: 11/7/06 Due: 5/7/07

Test ID: C22C22OCP05

Specimen Examination: Started 1/16/07 Ended 4/18/07
No Corrosion 0/24 feet of C-22 Crevice washer
Dull Blue tint staining on All C-22 material
No Corrosion on Crevice washers. mild Surface
Scratches for 75 In-lb Torque

[signature] 1/16/07



File names:
OCP C22C22_0118-Unl Ch1, 0123, 0130, 0206, 0213, 0220, 0222, 0227, 0306, 0313, 0320, 0327, 0402, 0403, 0410, 0417
X.H
5/15/07

The data is invalid.
Please refer to NCR 2007-14
X.H 6/4/07

Xichuan HE 4/24/07