HCS FIELD MANAGER
User's Manual

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1   Introduction

The *HCS Field Manager* is a component supplied by MEDA with the HCS01CL three-axis Helmholtz coil system that provides a software interface between an application program and the National Instruments PCI-6703 16-Channel digital-to-analog (DAC) plug-in board that resides in the PC used to control the HCS01CL system.

The *HCS Field Manager* requires the following environment:

- Microsoft Windows XP or Vista operating system.

- .Net Framework version 2.0 or higher.

- National Instruments PCI-6703 DAC.

- National Instruments NI-DAQmx Version 8.0 or later software package.

In order to develop programs that include this component you will need Microsoft Visual Studios 2005 or later.

The *HCS Field Manager* can be used to

- Set or get the value of the magnetic field component applied along any axis of the HCS01CL coil system.

- Set or get the value of the gradient coil field component applied along any axis of the HCS01CL coil system.

- Set or get the value of the zero adjustment field applied along any axis of the HCS01CL coil system.

The *HCS Field Manager* uses the calibration coefficients stored in the registry to apply calibrated magnetic fields and gradients. It corrects for scale factors, coil alignment, zero adjust alignment and gradient zero field error.

2   Getting Started

The *HCS Field Manager* class library (MEDAFieldMgr.dll) is located in the directory where the *HCS01CL Field and Gradient Manager* program (HCSFldGradMgr.exe) was placed during installation. The default location is **C:\Program Files\MEDA\HCSFldGradMgr**. Before it can be used in an application program it must be registered in Microsoft Visual Studios 2005.

To register *HCS Field Manager* in Visual Studios:

1. Start Microsoft Visual Studios 2005.

2. Open an existing project or create a new C# Windows project.

3. Open the form associated with the project.

4. Select **Toolbox** and right click in the **Components** section of the **Toolbox**.

5. Select **Choose Items…** in the pop-up menu.

6. When the **Choose Toolbox Items** dialog box appears click on the **Browse** button.

7. Navigate to the directory where *MEDAFieldMgr.dll* is located and double click on the file.

8. *HCSFieldMgr* will appear in the list of **Toolbox** items. Click **OK**.

The *HCSFieldMgr* will be placed in the **Toolbox** under **Components**. You can now embed this component in any program in the same way you embed any other **Toolbox** item by dragging it onto the form. You must also add *MEDAFieldMgr* as a reference in any new program that uses the component. Review the source code provided with the *HCS01CL Field and Gradient* program.

3   Properties and Methods

The HCS Field Manager component communicates with the application program through both properties and methods. The following table lists these properties and methods.

Type	Name	Description
Property	IsOpen	Gets the status of the component. It returns **true** if the component is open otherwise it returns **false**.
Property	DeviceNumber	Get the PCI-6703 device number assigned by National Instruments. Returns 0 if the component has not been opened.
Property	SystemType	Gets or Sets the system type. The default is 0, which indicates that it is an HCS01CL system. Do not change this from the default setting.
Property	XfieldMag	Gets or Sets the value of the X-axis field. Valid values are any **Int32** integer from -100000 to +100000 nT.
Property	YfieldMag	Gets or Sets the value of the Y-axis field. Valid values are any **Int32** integer from -100000 to +100000 nT.
Property	ZfieldMag	Gets or Sets the value of the Z-axis field. Valid values are any **Int32** integer from -100000 to +100000 nT.
Property	XgradMag	Gets or Sets the value of the X-axis coil gradient. Valid values are any **double** from -200.00 to +200.00 nT/inch.
Property	YgradMag	Gets or Sets the value of the Y-axis coil gradient. Valid values are any **double** from -200.00 to +200.00 nT/inch.
Property	ZgradMag	Gets or Sets the value of the Z-axis coil gradient. Valid values are any **double** from -200.00 to +200.00 nT/inch.
Property	Xzero	Gets or Sets the value of the X-axis zero adjustment. Valid values are any **Int16** from -4000 to +4000 nT.
Property	Yzero	Gets or Sets the value of the Y-axis zero adjustment. Valid values are any **Int16** from -4000 to +4000 nT.
Property	Zzero	Gets or Sets the value of the Z-axis zero adjustment. Valid values are any **Int16** from -4000 to +4000 nT.
Method	SetField(ref Int32[,] field)	Sets the field value of all three axes. Valid values are any **Int32** integer from -100000 to +100000 nT. Must be a 1x3 2D array.
Method	SetGrad(ref double[,] gradient)	Set the gradient value of all three axes. Valid values are any **double** from -200.00 to +200.00 nT per inch. Must be a 1x3 2D array.
Method	SetZero(ref Int16[,] zero)	Set the zero adjustment value of all three axes.

		Valid values are any **Int16** integer from -4000 to +4000 nT. Must be a 1x3 2D array
Method	Open()	Initializes the component and reads in the calibration coefficients from the registry. If it was successful **true** (1) is returned otherwise **false** (0) is returned.
Method	Close()	Closes the component. The component must be opened before any of the properties can be accessed or methods can be invoked.

The Open() method must be invoked before any of the properties can be accessed or the other methods can be invoked.

3.1 Properties

This section describes each of the *HCS Field Manager* properties. *MEDAFieldMgr* is the name of both the Namespace and Assembly. HCSFieldMgr is the class name within the namespace. A fully specified instantiation of the component has the following syntax:

MEDAFieldMgr.HCSFieldMgr hcsFieldManager;

3.1.1 IsOpen

Syntax

bool IsOpen {get;}

Property Value

A Boolean value that indicates the state of the component.

Remarks

This is a read-only property. A value of **true** indicates that the component has been opened. The component must be opened using the Open() method before any other properties can be accessed or methods invoked (except IsOpen and DeviceNumber properties).

3.1.2 DeviceNumber

Syntax

Int32 DeviceNumber {get;}

Property Value

An Int32 integer that represents the device number assigned by National Instruments to the PCI-6703.

Remarks

This is a read-only property that can be read by the user to determine the National Instruments assigned device number. If the returned value is 0 the component has not been opened or the PCI-6703 is not present.

3.1.3 SystemType

Syntax

Int16 SystemType {get; set;}

Property Value

An integer indicating the coil system interface type.

Remarks

The default system type is HCS01CL, which has a property value of 0. Do not change this value. This property is included for future products that may have a different interface.

3.1.4 XfieldMag

Syntax

Int32 XfieldMag {get; set;}

Property Value

A Int32 integer that is the X axis magnetic field value in nT. The number must be between -100000 and +100000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the field value is out of range.

3.1.5 YfieldMag

Syntax

Int32 YfieldMag {get; set;}

Property Value

A Int32 integer that is the Y axis magnetic field value in nT. The number must be between -100000 and +100000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the field value is out of range.

3.1.6 ZfieldMag

Syntax

Int32 ZfieldMag {get; set;}

Property Value

A Int32 integer that is the Z axis magnetic field value in nT. The number must be between -100000 and +100000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the field value is out of range.

3.1.7 XgradMag

Syntax

double XgradMag {get; set;}

Property Value

A double that is the X axis coil gradient value in nT/inch. The number must be between -200.00 and +200.00 nT/inch.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the gradient value is out of range.

Remarks

This property sets the gradient value of the X axis gradient coil not the X axis gradient. The X-axis gradient is determined by the gradient values of all three gradient coils. See the **Theory of Operation** section.

3.1.8   YgradMag

Syntax

double YgradMag {get; set;}

Property Value

A double that is the Y axis coil gradient value in nT/inch. The number must be between -200.00 and +200.00 nT/inch.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the gradient value is out of range.

Remarks

This property sets the gradient value of the Y axis gradient coil not the Y axis gradient. The Y-axis gradient is determined by the gradient values of all three gradient coils. See the **Theory of Operation** section.

3.1.9   ZgradMag

Syntax

double ZgradMag {get; set;}

Property Value

A double that is the Z axis coil gradient value in nT/inch. The number must be between -200.00 and +200.00 nT/inch.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the gradient value is out of range.

Remarks

This property sets the gradient value of the Z axis gradient coil not the Z axis gradient. The Z-axis gradient is determined by the gradient values of all three gradient coils. See the **Theory of Operation** section.

3.1.10 Xzero

Syntax

Int16 Xzero{get; set;}

Property Value

An Int16 that is the X axis zero adjustment value in nT. The number must be between -4000 and +4000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the zero value is out of range.

3.1.11 Yzero

Syntax

Int16 Yzero{get; set;}

Property Value

An Int16 that is the Y axis zero adjustment value in nT. The number must be between -4000 and +4000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the zero value is out of range.

3.1.12 Zzero

Syntax

Int16 Zzero{get; set;}

Property Value

A Int16 that is the Z axis zero adjustment value in nT. The number must be between -4000 and +4000 nT.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if the zero value is out of range.

3.2 Methods

3.2.1 Open()

Syntax

bool Open()

Return Value

Returns **true** if the PCI-6703 DAC board was successfully interfaced otherwise it returns **false**.

Remarks

This function should be invoked before any other property is accessed or function is invoked. The Open() function initializes the field, gradient and zero adjustment values to zero. It also reads in the field and calibration coefficients from the registry and initializes the scale factor and correction matrices.

3.2.2   Close()

Syntax

void Close()

Return Value

None.

Remarks

This function sets the IsOpen property to **false**.

3.2.3   SetField()

Syntax

void SetField(ref Int32[,] values)

Parameters

values

A 1x3 2D array of Int32 values in the range of -100000 to +100000 nT representing the X, Y and Z axes field values.

Return Value

None.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if any of the field values are out of range.

Remarks

This function sets the uniform magnetic field values for the X, Y and Z axes. If any of the values are out of range an exception is thrown and no field values are changed.

3.2.4   SetGrad()

Syntax

void SetGrad(ref double[,] values)

Parameters

values

A 1x3 2D array of double values in the range of -200.00 to +200.00 nT per inch representing the X, Y and Z axis gradient coil values.

Return Value

None.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if any of the gradient values are out of range.

Remarks

This function sets the gradient values for the X, Y and Z gradient coils. The actual gradient field depends on the gradient values of each gradient coil. See the **Theory of Operation** section. If any of the values are out of range an exception is thrown and no gradient values are changed.

3.2.5 SetZero()

Syntax

void SetZero(ref Int16[,] values)

Parameters

values

A 1x3 2D array of Int16 values in the range of -4000 to +4000 nT representing the X, Y and Z axis zero adjustment values.

Return Value

None.

Exceptions

NationalInstruments.DAQmx.DaqException: Thrown if there is a problem interfacing with the PCI-6703.

ArgumentOutOfRangeException: Thrown if any of the zero values are out of range.

Remarks

This function sets the zero adjustment values for the X, Y and Z axes. If any of the values are out of range an exception is thrown and no zero values are changed.

4 Theory of Operation

Figure 4-1 below is a block diagram for an HCS01CL with Gradient three-axis Helmholtz coil system.
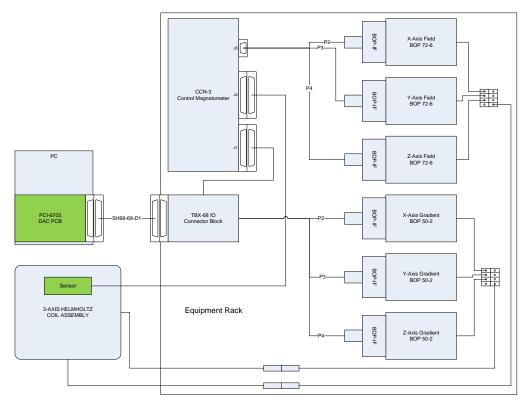
Figure 4-1 Block diagram of HCS01CL with Gradient three-axis Helmholtz coil system.

A PC with a National Instruments plug-in PCI-6703 16-channel 16-bit digital-to-analog converter board controls the application of HCS01CL magnetic fields. The *HCS Field Manager* component provides the application programming interface (API) between a user's application program and the HCS01CL through the PCI-6703.

The *HCS Field Manager* uses the HCS01CL calibration coefficients stored in the PC's registry to accurately apply fields and gradients along reference coordinate system axes defined by a user's calibration test fixture or MEDA's standard calibration test fixture. The calibration coefficients are measured and stored in the registry during the calibration of the HCS01CL. Although the application programmer does not need to deal with the various corrections that are made by the *HCS Field Manager* component, a good understanding of how the *HCS Field Manager* performs these operations is useful.

4.1   Calibration Coefficients Stored in the Registry

Table 4-1 lists the calibration coefficients that are stored in the PC's registry. The values can be found in HKEY_LOCAL_MACHINE\Software\MEDA\HCS01CLFldGradMgr. All values are of type string.

Table 4-1 Calibration correction factors stored in the PC registry.

Key	Nominal value	Applicable Field	Description
A00	10000.0	Uniform	X coil axis scale factor in nT/Volt * X coil axis to X reference axis direction cosine (nominally 0 degrees).
A01	0.00000	Uniform	X coil axis to Y reference axis direction cosine (nominally 90 degrees) * 10000.

A02	0.00000	Uniform	X coil axis to Z reference axis direction cosine (nominally 90 degrees) * 10000.
A10	0.00000	Uniform	Y coil axis to X reference axis direction cosine (nominally 90 degrees) * 10000.
A11	10000.0	Uniform	Y coil axis scale factor in nT/Volt * Y coil axis to Y reference axis direction cosine (nominally 0 degrees).
A12	0.00000	Uniform	Y coil axis to Z reference axis direction cosine (nominally 90 degrees) * 10000.
A20	0.00000	Uniform	Z coil axis to X reference axis direction cosine (nominally 90 degrees) * 10000.
A21	0.00000	Uniform	Z coil axis to Y reference axis direction cosine (nominally 90 degrees) * 10000.
A22	1.00000	Uniform	Z coil axis scale factor in nT/Volt * Z coil axis to Z reference axis direction cosine (nominally 0 degrees).
Z00	1.00000	Uniform	X zero-adjustment axis to X reference axis direction cosine (nominally 0 degrees).
Z01	0.00000	Uniform	X zero-adjustment axis to Y reference axis direction cosine (nominally 90 degrees).
Z02	0.00000	Uniform	X zero-adjustment axis to Z reference axis direction cosine (nominally 90 degrees).
Z10	0.00000	Uniform	Y zero-adjustment axis to X reference axis direction cosine (nominally 90 degrees).
Z11	1.00000	Uniform	Y zero-adjustment axis to Y reference axis direction cosine (nominally 0 degrees).
Z12	0.00000	Uniform	Y zero-adjustment axis to Z reference axis direction cosine (nominally 90 degrees).
Z20	0.00000	Uniform	Z zero-adjustment axis to X reference axis direction cosine (nominally 90 degrees).
Z21	0.00000	Uniform	Z zero-adjustment axis to Y reference axis direction cosine (nominally 90 degrees).
Z22	1.00000	Uniform	Z zero-adjustment axis to Z reference axis direction cosine (nominally 0 degrees).
GSF0	0.05	Gradient	X-axis gradient coil scale factor in Volts/nT/inch.
GSF1	0.05	Gradient	Y-axis gradient coil scale factor in Volts/nT/inch.
GSF2	0.05	Gradient	Z-axis gradient coil scale factor in Volts/nT/inch.
X00	0.00	Gradient	X-axis gradient zero-correction coefficient for X-axis gradient coil fields in inches.
X01	0.00	Gradient	X-axis gradient zero-correction coefficient for Y-axis gradient coil fields in inches.

X02	0.00	Gradient	X-axis gradient zero-correction coefficient for Z-axis gradient coil fields in inches.
X10	0.00	Gradient	Y-axis gradient zero-correction coefficient for X-axis gradient coil fields in inches.
X11	0.00	Gradient	Y-axis gradient zero-correction coefficient for Y-axis gradient coil fields in inches.
X12	0.00	Gradient	Y-axis gradient zero-correction coefficient for Z-axis gradient coil fields in inches.
X20	6.00	Gradient	Z-axis gradient zero-correction coefficient for X-axis gradient coil fields in inches.
X21	6.00	Gradient	Z-axis gradient zero-correction coefficient for Y-axis gradient coil fields in inches.
X22	-11.00	Gradient	Z-axis gradient zero-correction coefficient for Z-axis gradient coil fields in inches.

4.2   Uniform Field Scale Factor and Alignment Corrections

The mechanical alignment of the HCS01CL Helmholtz coils used to generate the uniform field is not perfectly orthogonal. The orthogonality error between any two sets of coils can be as much as 1 degree. Also the scale factor (nT/Volt) will be slightly different for each axis. Initial adjustments of the HCS01CL after installation make coarse scale factor corrections but do not correct for the angular alignment errors.

Scale factor and alignment corrections are done in software. These corrections are dependent on the calibration test fixture that is used to measure the correction factors. The calibration test fixture defines the orthogonal reference coordinate system for the coil system and is usually supplied by the user. MEDA has a standard test fixture that can be used to calibrate the system if the customer does not have a fixture. The residual alignment errors after correction depend heavily on the quality of the test fixture. The best designed fixtures can usually achieve an alignment error of between 0.05 and 0.1 degrees. Optical techniques can be used if better alignment is required.

The following equation defines the relationship between the resulting uniform fields and the fields generated by the coils:

$$\vec{H} = B \cdot \vec{H}_c \qquad (1)$$

Where H is the desired magnetic field vector in nT; H_c is the field produced by the individual Helmholtz coils in nT; and B is the 3x3 alignment matrix relating the two fields.

The following equation is the relationship between the PCI-6703 output voltages and the coil fields:

$$\vec{H} = K \cdot \vec{V}_c \qquad (2)$$

Where K is a diagonal 3x3 scale factor matrix and V_c is the DAC voltage vector.

Combining equation (1) with equation (2) give

$$\vec{H} = [B \cdot K] \cdot \vec{V}_c \quad (3)$$

The 3x3 matrix in the square brackets is the scale factor and alignment matrix given by A00 through A22 in the registry.

Once the A scale factor and alignment matrix is known through the calibration process the DAC voltages need to produce the desired field can be computed using the following equation.

$$\vec{V_c} = A^{-1} \cdot \vec{H} \qquad (4)$$

4.3 Zero Adjustment Scale Factor and Alignment Corrections

The zero adjustment scale factors are set to a nominal value of 400 nT per Volt during the initial setup of the system. There are no physical corrections for zero coil misalignment. Under most circumstances there is no need to correct the zero-adjustment alignment since changes to the initial setting are small and, therefore, there is little interaction between the coil adjustments. Because the change in zero can be quite significant when a gradient field is applied, alignment correction of the zero adjustment is much more important. The HCS01CL calibration includes determining both the scale factors and alignment corrections needed to minimize interactions between coils when the zero is adjusted.

The zero adjustment scale factors and alignment corrections are performed the same way that the uniform field scale factors and alignment corrections are made except that the coefficients are normalized to the nominal zero-adjustment scale factor (400 nT per Volt). This is expressed by the following equation:

$$\vec{V_z} = Z^{-1} \cdot \frac{\vec{H_z}}{400} \qquad (5)$$

Where V_z is the DAC zero-adjustment voltage vector; Z^{-1} is the inverse of the zero adjustment scale factor and alignment correction matrix (Z00 through Z22 in the registry); and H_z is the desired zero-adjustment field vector in nT.

4.4 Gradient Field Scale Factor and Zero Corrections

The gradient field scale factors are determined during the calibration process by measuring the field at the center of the coil system and 2.5 inches from the center of the coil system at a DAC voltage of 10 Volts. Thus the scale factor is 25 divided by the field difference. The nominal gradient coil scale factor is 0.05 Volts per nT per inch. GSF0, GSF1 and GSF2 in the registry are the scale factors for the X, Y and Z gradient coils.

The feedback system adjusts the feedback field so that the net field at the sensor is essentially zero. When one of the gradient coils is turned on it produces a gradient field that is seen by the feedback sensor. The feedback system will then adjust the feedback field to cancel the affect at the sensor location. If not corrected, this will cause the field at the center of the coil system to change since there is now a defined gradient between the feedback sensor and the center of the coil system. This relationship can be expressed by the following equation:

$$\vec{H}_{center} = \begin{bmatrix} x_{11} & x_{12} & x_{13} \\ x_{21} & x_{22} & x_{23} \\ x_{31} & x_{32} & x_{ee} \end{bmatrix} \vec{G_c} \qquad (6)$$

Where H_{center} is the field vector generated at the center of the coil system caused by the gradient coil vector G_c. The matrix connects the gradient field vector to the center field vector and its coefficients have the dimension of inches. The matrix coefficients are measured during the calibration process and stored in the registry. The *HCS Field Manager* uses these values to automatically correct for the zero-shift caused by the application of a gradient. The X00 through X22 values in the registry correspond to the zero correction matrix elements.

The X and Y axis sensors in the control sensor are very close to being in the central plane of the Helmholtz coil pair associated with them so the X and Y gradient coils produce only a small change in the field at the center. The Z axis sensor is displaced by about 11 inches from the central plane of the Helmholtz coil pair associated with it so it has the greatest affect on the shift in field at the center.

4.5 Generated Gradient Field

The gradient fields are produced by applying precision currents through Helmholtz coils that are wound on top of the Helmholtz coils used to generate the precision uniform field. The gradient

field is produced by connected these coils in opposition. The gradient field produced by the gradient coils is given by the following equation:

$$\vec{G} = \begin{bmatrix} 1 & -0.5 & -0.5 \\ -0.5 & 1 & -0.5 \\ -0.5 & -0.5 & 1 \end{bmatrix} \vec{G_c} \quad (7)$$

Where *G* is the desired gradient vector along the reference axes and G_c is the coil gradient vector. The matrix connecting these two vectors is singular so there is no inverse. That means that it is not possible to independently set all three gradient field components. The constraint is $G_x + G_y + G_z = 0$. An application program must take this into consideration when determining what gradients the gradient coils need to produce to generate the desired field gradient.

It is recommended that only two gradient coils be used to generate the gradient fields with the third gradient coil set to zero. All gradient values in the -100.0 to +100.0 nT per inch specified range can be achieved using any pair of coils. The desired gradient values along the reference axes should be limited to 100 nT per inch in order to keep the maximum coil gradients within their 200 nT per inch range.

5   HCS Field Manager Installer

Normally when executing a program that uses the *MEDAFieldMgr.dll* component, the *MEDAFieldMgr.dll* file is located in the same directory as the application program. This is the recommended method but in some instances the user may want to use the Properties and Methods of the *MEDAFieldMgr.dll* though COM. In this case the *MEDAFieldMgr.dll* assembly must be registered in the Windows registry before it can be activated from a COM client. On the CD that comes with the HCS01CL system there is a program that can be used to create the registry entries and locate the assembly in the Global Assembly Cache (GAC) where it can be found by a COM client.

To install the *MEDAFieldMgr.dll* into the GAC and create the appropriate registry entries:

1. Place the HCS01CL CD in a CD or DVD drive.

2. When the dialog box to install the *HCSFldGradMgr* software appears click on cancel.

3. Navigate to the *HCS Field Manager Installer* directory and double click on *Setup.exe*.

4. Respond to the prompts.

The Setup program will place the *MEDAFieldMgr.dll* and other support files into the **C:\Program Files\MEDA\HCS Field Manager Installer** directory. It will also place the assembly in the GAC (C:\Windows\assembly) and make the following entries in the registry:

HKEY_CLASSES_ROOT\MEDAFieldMgr.HCSFieldMgr

@="MEDAFieldMgr.HCSFieldMgr"

HKEY_CLASSES_ROOT\MEDAFieldMgr.HCSFieldMgr\CLSID

@="{98CFF84C-D093-43FE-84A2-B0B8B5643D63}"

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}

@="MEDAFieldMgr.HCSFieldMgr"

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}\Implemented Categories

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}\Implemented Categories\{62C8FE65-4EBB-45E7-B440-6E39B2CDBF29}

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}\InprocServer32

@="mscoree.dll"

"RuntimeVersion"="v2.0.50727"

"CodeBase"="C:\\Program Files\\MEDA\\HCS Field Manager Installer\\MEDAFieldMgr.dll"

"Assembly"="MEDAFieldMgr, Version=1.0.0.0, Culture=neutral, PublicKeyToken=8bf06c1ce0c21ef7"

"Class"="MEDAFieldMgr.HCSFieldMgr"

"ThreadingModel"="Both"

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}\InprocServer32\1.0.0.0

"Class"="MEDAFieldMgr.HCSFieldMgr"

"Assembly"="MEDAFieldMgr, Version=1.0.0.0, Culture=neutral, PublicKeyToken=8bf06c1ce0c21ef7"

"RuntimeVersion"="v2.0.50727"

"CodeBase"="C:\\Program Files\\MEDA\\HCS Field Manager Installer\\MEDAFieldMgr.dll"

HKEY_CLASSES_ROOT\CLSID\{98CFF84C-D093-43FE-84A2-B0B8B5643D63}\ProgId

@="MEDAFieldMgr.HCSFieldMgr"

The @ symbol indicates that this is a default value.

At his point the HCSFieldMgr.dll can be activated by a COM client.