



MTS SYSTEMS CORPORATION



Project Calibration Plan Process

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be certain.

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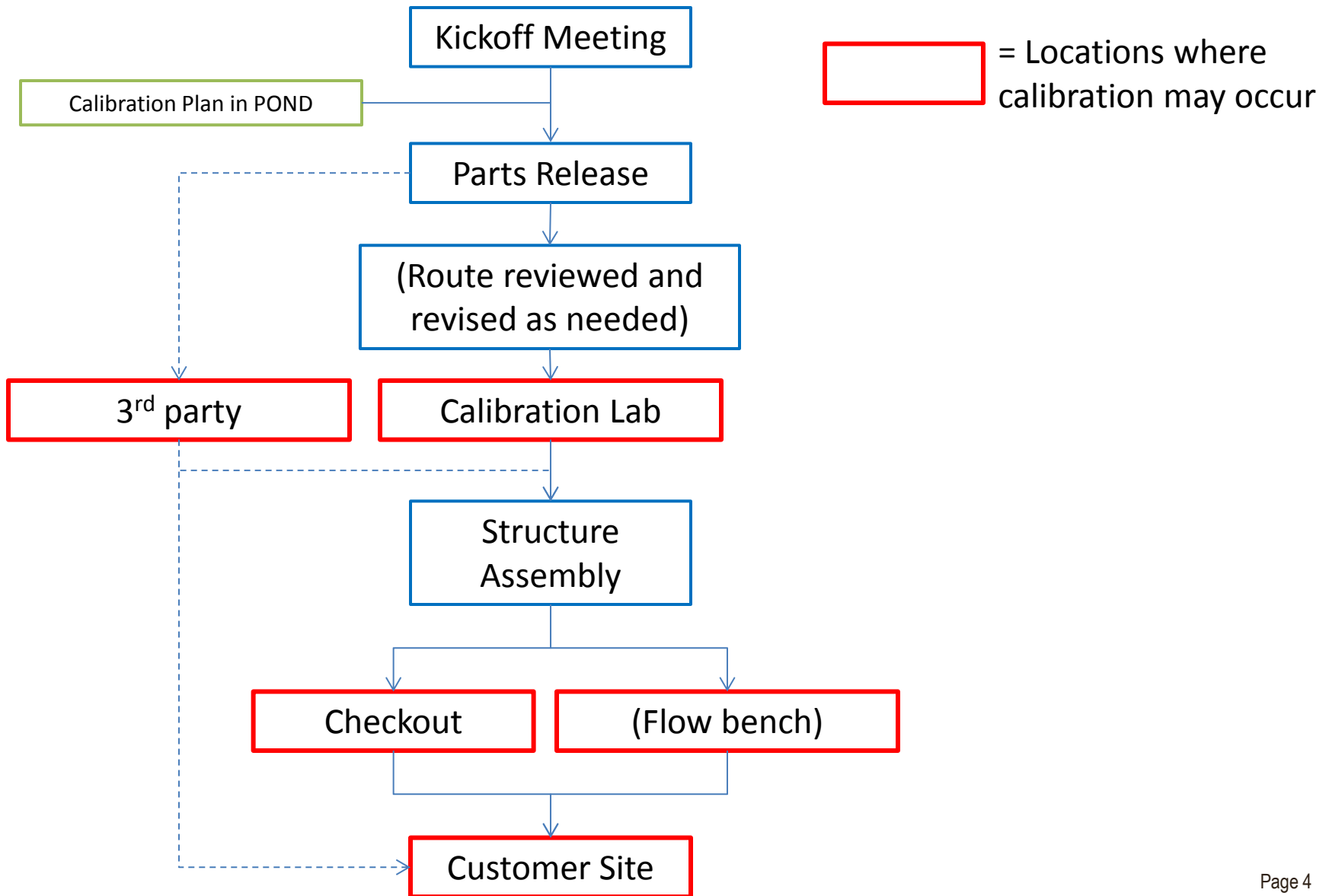
Introduction

- » Calibration Plans are used to communicate the set of information describing the required hardware and its required operating parameters (ranges, polarities, units, etc.) of each transducer

- » Calibration plans are required for:
 - Non-Variant Configurator (VC) and non-Newton system releases
 - Accessories that require calibration, such as extensometers, must have an associated calibration plan even when configured in VC

- * System-level components (ex. LVDT on a Landmark system) configured using VC do not need calibration plans

Key Calibration Milestones in a Project




Defining Responsibility - Project Kickoff Process

- » When the Project Engineer hosts a kickoff meeting for a project, formal or informal (in-person or via email/phone), the Project Engineer will assign the responsibility: **who will create the calibration plans and place in the appropriate POND folder before the part is released**
 - The P.E. will assume calibration plan responsibility for all material they release
- » The P.E. is responsible for clarifying any unknown calibration specifications with the customer
 - The **engineering** team helps define required unknowns
- » Defined responsibilities should be documented in kickoff meeting notes

Calibration Plan Work Instruction



- » QMS Calibration Plan Location:
 - QMS-Engineering and Project Quality => General Engineering => Calibration Plans
=> “ZPRJ – Create Calibration Plan Work Instruction”

	QMS Work Instruction MTS Systems Corporation – MTS Test	Document Number: n/a	Rev.: D
Title: Calibration Plan Creation		Page #: 1 of 5	
Work Instruction Owner(s) – list functions: Mechanical Engineering		Revision's Training Requirements – select one (per section #9): Awareness X Formal X	

- 5.1 The Calibration Plan Creator is responsible for:
 - 5.1.1 Identifying the customer order’s calibration requirements
 - 5.1.2 Filling out the calibration form(s) in a complete and correct manner
 - 5.1.3 Publishing the calibration plan(s) in .pdf format to the calibration plan POND folder

*see QMS work instruction for complete instructions

Identify Project Calibration Requirements

» What transducers are required for the system?

6 Instruction

- 6.1 Review the customer order's calibration requirements from the customer project folder
- 6.2 Types of transducers requiring calibration plans:
 - 6.2.1 Extensometers, Displacement Gauges
 - 6.2.2 Force and Torque Transducers
 - 6.2.3 Delta-P Transducers (Pressure)
 - 6.2.4 Accelerometers
 - 6.2.5 LVDT, ADT (Displacement Transducers)
 - 6.2.6 Other specialized transducers

From QMS Work Instruction

» What attributes do these need?

- Conditioner, Units, Polarity, Range, etc

» Where will the transducers be calibrated?

- Calibration Lab
- Flow Bench (LVDT's)
- Checkout
- Customer Site
- Third Party

Understanding the Hardware Workflow

- » The responsible release engineer should understand the routing of parts and how they correspond to calibration requirements
 - If a new part number is being created, the releasing engineer must communicate routing requirements to the manufacturing engineer
 - If an existing part is being re-released, but needs a new calibration location, a new part number is required
 - Communicate with the responsible manufacturing engineer to ensure the part is routed correctly

Understanding the Hardware Workflow

» Use transaction **CA03** to investigate part routing

Example of an actuator routed through the flow bench for test and calibration:

Material 100-199-183 ACTUATOR ASSY-353.20, CALIBRATED Grp.Count1																
Sequence 0 <input type="text"/>																
Operation Overv.																
Op...	SOp	Work ...	Plnt	Co...	Long...	S..	Description	Setup	U...	Activi...	Labor	U...	Activi...	S...	U...	B..
0010		A6120	1101	PP01	<input checked="" type="checkbox"/>	A...	Assemble per print.	0.000	H	600	6.500	H	600	<input type="checkbox"/>	EA	1
0020		A6320	1101	PP01	<input checked="" type="checkbox"/>	T...	Test per print/procedure. Call PE wit...	0.000	H	606	8.000	H	606	<input type="checkbox"/>	EA	1
0030		A6340	1101	PP01	<input type="checkbox"/>	A...	Calibrate per Requirements	0.000	H	731	4.000	H	731	<input type="checkbox"/>	EA	1
0040		S1000	1101	PP06	<input type="checkbox"/>	S...	Move to Stores	0.000	H		0.000	H		<input type="checkbox"/>	EA	1

Select the Appropriate Calibration Plan Form

MTS Homepage => QMS => Engineering and Project Quality => General Engineering

Pre-sale Reviews

- PERT
- Team Review
- CORRA

General Engineering

- Hazard Analysis / Safety
- CE and EC Standards
- DoD (Documents on Demand)
- Finder
- POND (Projects ON Demand)
- CTQ (Critical To Quality)
- Project Reviews and Execution Plan (PREP)
- Product Traceability
- **Calibration Plans**
- Engineering Standards Library
- Engineering Records Control

Project Engineering - ETO and Custom

- Kick-off Meeting
- Monthly Project Review (Financial)
- Order Cancellation / Postponement Request
- Job Order Packet / POND
- Project Delivery Processes
- Warranty
- FIOP / Archive
- Lessons Learned
- Checkout Plans
- Request for Invoice - PE

Process Resources/Documentation

Metrics and Analysis

- ▶ Cal Plan Metric and Analysis

Procedures

- ▶ ZPRJ - Calibration Plan Procedure

Process Flows and Work Instructions

- ▶ ZPRJ - Create Calibration Plan Work Instruction
- ▶ ZPRJ - Create Calibration Plan Workflow
- ▶ ZISO - Create Calibration Plan Work Instruction
- ▶ Calibration Process Owner Flow
- ▶ Release Process Flow

Forms, Templates and Tools

- ▶ Transducer Calibration Plan Form - "Single Channel" (Except 329)
- ▶ 329 Calibration Plan Form (Use for a 329 Order's Cal Plan)
- ▶ Calibration Plan Form Change Log
- ▶ Calibrated PN Cross Reference
- ▶ Cable Inventory - Cal Lab
- ▶ DMAIC project Control Plan
- ▶ RAIL (Process Owners)

Training Materials

- ▶ Calibration Plan Training
- ▶ Transducer Calibration Plan V3 Instructions

External Links

Create Calibration Plan Form

- » Instructions on using the form can be found in the *Training Materials* section of the Calibration Plan QMS page for current forms:

Training Materials

▶ Calibration Plan Training

▶ Transducer Calibration Plan V3 Instructions

- » The responsibility of this task is assigned at the kickoff meeting

Example Calibration Plan Form

	MTS Customer Transducer Calibration Plan		
Created On:	8/26/2015	Contact:	Ben Weidmann
WBS:	US2.53765.MST-01	Extension:	4242
Customer Name:	TianCheng		

Project/Contact Information

IMPORTANT:

Selection or data entry in all fields is required.
Incomplete calibration plans are not acceptable and will cause delays.

Form Version 3.0.12

Transducer Type: **Accelerometer**
Transducer Conditioning: **DC**

Model No: **ENDEVCO 7290E-30**
Part / Assembly No: **100-268-709**

Conditioner Model: **494.26 DUC**

793 Software Version: 793 Version 5.5 or newer

Options: **Non-TEDS
Select...**

Cable Source: **New, supplied by MTS**

Cable Length: **< 350 feet**

Cable Length not required for lengths of 350 feet or less.

Conditioner Configuration: 8-Wire (494 Standard)
 6-Wire (494 Optional)

PLEASE NOTE:

Calibration data points below 2% of transducer full scale capacity will not be measured or reported.

Calibration Units: **English**

Engineering Unit: **g's**

Calibration Range Qty: **1**

Cal Range Maximums: **+/-30**

Output Polarity: **Normal**

Maximum Calibration Frequency (Hz): **MAST: 10 Hz to 800 Hz**

Conditioner Filter Mode: **Filter "Off" Only**

Conditioner Filter Setting (Hz): **N/A if Filter Mode is "Off"**

Hardware information and configuration

Project-specific calibration requirements

Place Completed Calibration Plan in POND

1. Complete the appropriate InfoPath calibration plan form
2. Select *File -> Publish as PDF -> Save*
3. Save Calibration Plans to the project POND folder “Calibration_Plans”
4. Calibration Plan PDF file names should follow this convention:
 - » For single channel calibration plans “<Sales Order #>_<Transducer Type>_<Model Number>_<wild card>.pdf”
 - <Transducer Type> must be one of the following strings:
 - “Extensometer”, “Force”, “Torque”, “Delta-P”, “Pressure”, “Accelerometer”, “LVDT”, “Pressure”, or similar descriptor noun
 - “<*>” is a wild card to be used to provide another level of clarification
 - Examples include part number, channel, quantity (ex. 1 of 3), other
 - Listing the part number is preferred
 - Example 1: “36944_Load Cell_45-430-011.pdf”
 - Example 2: “36944_Displacement_Vertical_quantity3.pdf”
 - Example 3: “36944_Extensometer_632.11C-01_1of3.pdf”

Place Completed Calibration Plan in POND

- » For SWIFT calibration plans “<Sales Order #>_<SWIFT>_<model#>.pdf”
 - Example: “39187_SWIFT_20A.pdf”

- » For Multiple Channel Product specific calibration plans such as the 329 family, there will be more than one file. The files shall be constructed so that each file’s content is specific to the intended calibration area. The Form has been constructed to assist in this output choice. “<Sales Order #>_<ProductName>_<Transducer Type>. pdf”
 - Example 1: “37564_329_ DISPLACEMENT.pdf”
 - Example 2: “37564_329_ LOAD CELL.pdf”

Process Enhancement

- » To minimize delays during calibration steps, a tool has been created to flag PEs when hardware for their projects is planned for calibration in Eden Prairie
 - Does not apply for calibrations planned in system checkout
- » Communication is essential to any process; ensure new part number requirements and special situations are clearly communicated to all stakeholders

Review

- » Identify Requirements
- » Kickoff Meeting
 - Identify requirements
 - Assign release responsibilities, including Cal Plan responsibility
- » Calibration Plan process
 - Save as PDF in POND
 - Follow the naming convention
 - Place in POND at the time of final/manufacturing release
 - Ensure released part numbers are routed correctly
- » Need Help?
 - [QMS Page](#)
 - Contact Ben Weidmann, Sylvia Nasla, or David Kreitlow