Project Calibration Plan Process

V.2 October 2017

be certain.

Contents

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-Newton Project Configurator (NPC) system releases
   - Accessories that require calibration, such as extensometers, must have an associated calibration plan (unless defined in NPC)

   - NPC releases that require non-standard calibration

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

Key Calibration Milestones in a Project

Kickoff Meeting

Calibration Plan in POND

Parts Release

(Route reviewed and revised as needed)

3rd party

Calibration Lab

= Locations where calibration may occur

Structure Assembly

Checkout

(Flow bench)

Customer Site
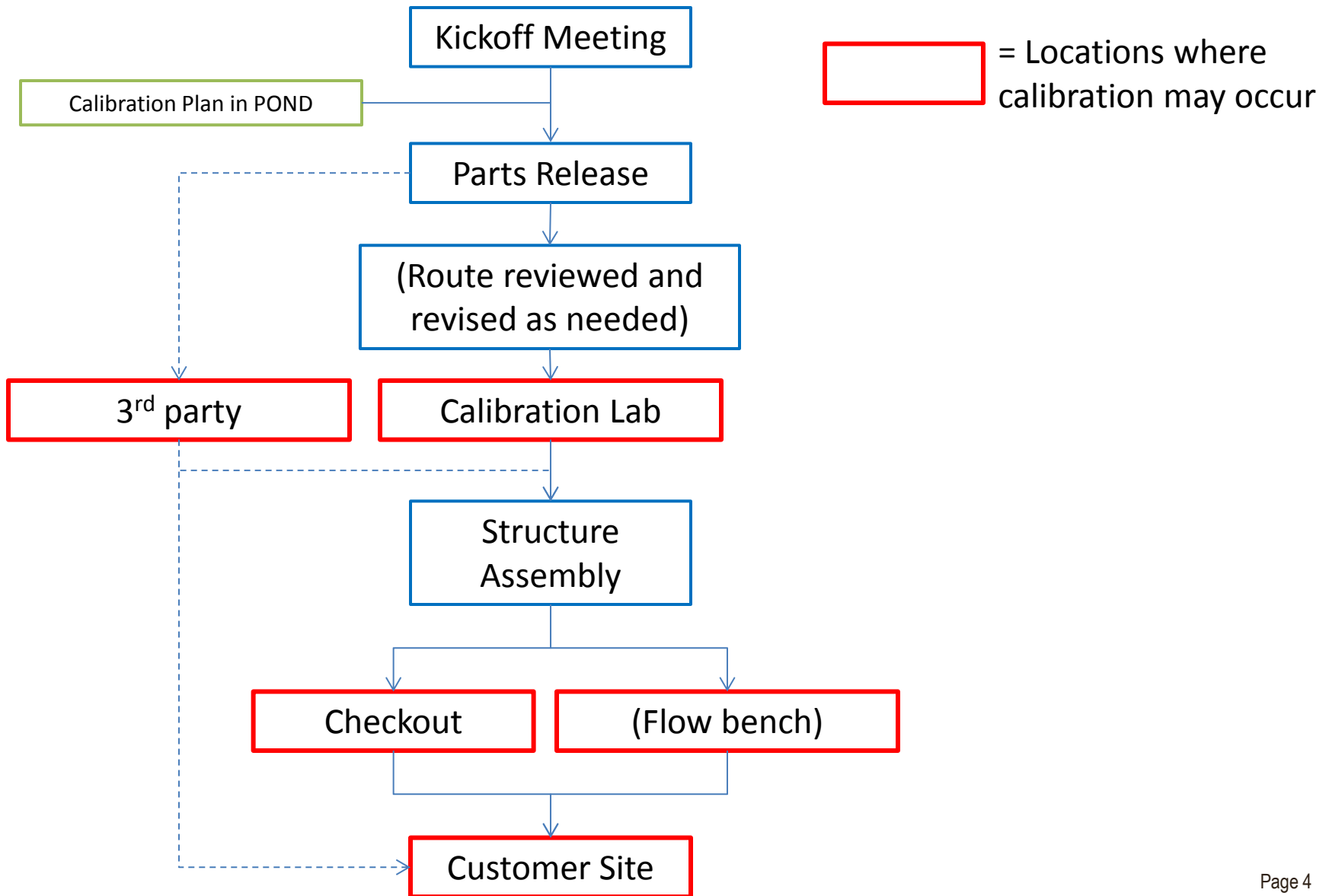
Defining Responsibility - Project Kickoff Process

» 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**"*

MTS	**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 ✗ Formal ✗**	

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

» ## 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, <u>a new part number is required</u>
  - – <u>Communicate</u> 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														

Operation Overv.

	Op...	SOp	Work ...	Plnt	Co...	Long...	S..	Description	Setup	U...	Activi...	Labor	U...	Activi...	S...	U...	B..
	0010		A6120	1101	PP01	☑	A...	Assemble per print.	0.000	H	600	6.500	H	600	☐	EA	1
	0020		A6320	1101	PP01	☑	T...	Test per print/procedure. Call PE wit...	0.000	H	606	8.000	H	606	☐	EA	1
	0030		A6340	1101	PP01	☐	A...	Calibrate per Requirements	0.000	H	731	4.000	H	731	☐	EA	1
	0040		S1000	1101	PP06	☐	S...	Move to Stores	0.000	H		0.000	H		☐	EA	1

Non-standard Calibration for NPC Release

- If NPC is used to release an accessory or system requiring calibration that cannot be defined via standard NPC options, the route must be manually changed after releasing the hardware
- Once released via NPC, contact the metrology Manufacturing Engineer in order to manually update the route with the correct calibration requirements

Select the Appropriate Calibration Plan Form

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

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

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

Project/Contact Information

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)

Hardware information and configuration

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"**

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