JSP 886
THE DEFENCE LOGISTICS SUPPORT CHAIN MANUAL

VOLUME 5
TECHNICAL SUPPORT MANAGEMENT

PART 1
TEST AND MEASUREMENT EQUIPMENT

THE MASTER VERSION OF JSP 886 IS PUBLISHED ON THE DEFENCE INTRANET.

FOR TECHNICAL REASONS, EXTERNAL LINKS ON THIS INTERNET VERSION HAVE BEEN REMOVED.

VERSION RECORD		
Version Number	**Version Date**	**Description**
1.0		
1.1	20 Dec 06	
1.2	03 Oct 07	Revised to reflect DE&S organisation
1.2a	11 Nov 08	Revised to clarify current version
1.3	25 Jan 10	Changes to Ownership and Points of Contact

CONTENTS

FIGURES

CHAPTER 1 - INTRODUCTION TO TEST AND MEASUREMENT EQUIPMENT

PURPOSE

1. This Part of JSP886 covers all aspects of Test & Measurement Equipment (TME). It includes policy, advice, procurement and through life management of General Purpose Test and Measurement Equipment (GPTME), along with the provision of policy and advice on both Strategic and Non-Strategic, TME calibration and Automatic Test Solutions. All personnel associated with TME procurement, management and maintenance at all levels of MOD are to observe and comply with the requirements of this policy.

2. This instruction covers the following areas:

a. **Chapters 2 and 3 – The Procurement and Management of Automatic Test Systems (ATS)**. The Automatic Test Systems Organisation (ATSO) is part of the Defence Equipment & Support (DE&S) organisation. It has been tasked with providing Defence Policy and Guidance on ATS.

b. **Chapter 4 – The Supply and Management of General Purpose Test and Measurement Equipment (GPTME)**. The primary aim of this chapter is to state how GPTME will be managed within the MOD. A secondary aim relates to the provision of advice and assistance on the selection and introduction into service of both GPTME and Special-Purpose TME (SPTME).

c. **Chapters 5 and 6 – Calibration of TME**. This chapter outlines the policy for the calibration of TME used throughout the MOD, except where other overriding documents or agreements exist. The application of this policy is intended to provide MOD customers with confidence in the quality of calibration provided, as all TME must be capable of fulfilling its intended role, taking into account product safety and fitness for purpose. This is achieved by calibrating TME at prescribed time intervals, to a specified requirement, against Measurement Standards which have accuracy traceable to the UK National Measurement Standards or similar National Measurement Standards held by countries which operate a Memorandum of Understanding with the UK.

OWNERSHIP AND POINTS OF CONTACT

3. The policy, processes and procedures described in the Defence Logistics Support Chain Manual (JSP 886) are jointly owned by Director Joint Support Chain (D JSC). Head of Supply Chain Management (Hd SCM) is responsible for the management of JSC policy on behalf of D JSC. The policy sponsor for this document is DES JSC TLS Pol.

a. Enquiries concerning the content and accessibility of this instruction should be made to the policy sponsor:

DES JSC TLS-POL–PC5
Annexe A1, Block F, Foxhill, Bath, BA1 5AB
Tel: Civ: 01225 882891 Mil: 9355 82891
Email: DESJSCTLS-Pol-PC5@mod.uk

Linked Publications

4. The following publications are linked to this instruction:

   A. Support Solutions Envelope (SSE) - Key Support Area (KSA) 2 - Supportability Engineering.
   B. DEFSTAN 00-14. The use of Abbreviated Test Language for All Systems (ATLAS) in the Defence Industry. Reprinted February 1998 incorporating Erratum dated 26 January 1998.
   C. DEFSTAN 05-55. Measurement and Calibration System requirements for Ministry of Defence Test and Measurement Equipment. Parts 1 - 3.
   D. DEFSTAN 05-57. Configuration Management of Defence Materiel. Issue 5 Publication Date 17 June 2005.
   E. BS EN ISO / IEC 17025:2000. General Requirements for the Competence of Testing and Calibration Laboratories.
   F. BS EN ISO / IEC 9001:2000. Quality Management Systems – Requirements.
   G. BS EN ISO / IEC 10012:2003. Measurement Systems – Requirements for Measurement Processes and Measurement Equipment.
   H. UKAS M3003. The Expression of Uncertainty & Confidence in Measurement.
   I. IEEE 1641-2004. IEEE Standard for Signal and Test Definition
   J. IEEE 488. IEEE Standard for Digital Interface for Programmable Instrumentation.
   K. JSP440. Defence Manual of Security.
   L. JSP509. Catalogue of General Purpose Test and Measurement Equipment (GPTME).

Superseded Publications

5. The following publications are superseded by this instruction:

   A. Army Code 63740 – Army Test and Measurement Equipment Calibration Policy and Procedures.
   B. Army Code 63741 – Operation and Management of Army Calibration Laboratories.
   C. Army Code 63742 – Procedures for the User Level Calibration of Mechanical Test and Measurement Equipment.
   D. Army Code 63743 – Periodicity and Levels of Calibration for Mechanical Test and Measurement Equipment.
   E. BR1781 – Common Range Electrical Testing Equipment.

CHAPTER 2 - PROCUREMENT AND MANAGEMENT OF AUTOMATIC TEST SYSTEMS (ATS) POLICY

Background

1. The lack of a central and co-ordinated policy on Automatic Test Systems (ATS) has led to a proliferation of automatic test solutions across the three Services. Rapid advances in technology mean that these systems, often with an in-service life in excess of 20 years, suffer from a high degree of obsolescence problems. This, coupled with the lack of commonality between them, results in high in-service support costs and, in some instances, relatively low utilisation figures for the test platform.

2. The inevitable pressures to drive support costs down, together with today's joint operational environment requirements for the maximum degree of interoperability, demand a more cohesive approach to the supply of ATS.

3. Policy and guidance on ATS across the three Services is now provided by DES SE TLS-TM ATS.

Intent

4. To provide direction to the Defence community on the criteria to be followed for the procurement or updating of ATS used in support of the Armed Services.

Scope

5. This policy applies to all projects involved in the procurement and in-service support of ATS. It is integral to the directives contained within the Acquisition Operating Framework (AOF). All projects are to adopt this policy, unless they can demonstrate improved Value For Money (VFM) and reduced Whole Life Cost (WLC) throughout the UK MOD, and not just an individual programme.

Aims

6. In the short term this policy will provide a cohesive approach to the development of common test solutions for existing ATS.

7. In the longer term it will lead to the adoption of an Open Architecture ATS and in so doing will:

   a. Minimise the obsolescence effects of rapidly changing technology.

   b. Encourage the development of a common core, re-configurable ATS.

   c. Increase interoperability between Services' support equipment.

   d. Facilitate upgrading of the ATS to meet any change in test requirements.

   e. Minimise Intellectual Property Rights (IPR) issues.

   f. Reduce reliance on sole providers.

8. The adoption of common test platforms and solutions will:

a. Greatly reduce support costs.

b. Increase the utilisation of the test platform.

c. Reduce the overall ATS footprint.

d. Increase interoperability between our coalition partners.

Implementation

9. When specifying the procurement of, or change to, an ATS, the project officer shall:

a. Establish if an ATS system already in service, which with the purchase of new Test Program Sets (TPS) and / or equipment modules, will satisfy the test requirement.

b. Ensure new TPS shall not be written in a company specific test language.

c. Ensure all TPS data is owned by MOD.

d. Ensure new requirements are specified in terms of an open architecture ATS and the Signal Test Definition (STD) standard shall be used.

e. Maximise use of Commercial Off The Shelf (COTS) equipment within open architecture ATS.

f. Ensure evidence of compliance against relevant regulations shall be provided, eg hazardous environments.

CHAPTER 3 - PROCUREMENT AND MANAGEMENT OF AUTOMATIC TEST SYSTEMS (ATS)

Introduction

1. Automatic Test Systems (ATS) are at the forefront of technology with many different types and designs developed for a wide range of applications. For this reason, this chapter includes a summary of the different types of Automatic Test Equipment (ATE) / ATS and the design considerations that are likely to be encountered in the MOD.

Automatic Test Equipment (ATE) Systems Overview

2. An ATE system will invariably include:

a. **Controller**. The controller will be the core computing module which will control the test procedures and form the means by which an operator will control the ATE. Invariably, it will be in the form of a Personal Computer (PC) or workstation, but older ATE will have a controlling element embedded within the core of its hardware. The software for the ATE will be stored within the controller or in a remote device accessed by the controller.

b. **Instrumentation**. The ATE will comprise a range of test and measurement instrumentation. These will be a range of discrete instruments whose function (ie ranges, application to a test, and responses) will be under the control of the controller.

c. **Interface Switching**. Various methods are used to link the test instrumentation to the ATE Test Head. The switching or linking may be achieved by relays controlled by the system controller.

d. **Digital ATE**. A digital ATE is one which is used to perform tests on purely digital circuitry. Such ATE falls into two categories: an in-circuit ATE or a functional ATE as described below.

e. **In-Circuit ATE**. An in-circuit ATE is a digital ATE which uses a 'bed of nails' interface to connect to a Printed Circuit Board (PCB). The bed-of-nails fixture comprises a bed of very accurately placed pins onto which the PCB is drawn by vacuum pressure. The pins are designed to penetrate any conformal coating and to accurately and resiliently make contact with strategically placed test points on the surface of the PCB. Such fixtures are particularly expensive to design and develop. In-circuit ATE is rarely used in the MOD, mainly due to cost and reliability issues, but also because the test philosophy does not provide a sufficiently complete test of the Unit Under Test (UUT).

f. **Functional ATE**. Functional ATE is used to test UUT's by interfacing with the external connectors without the need to dismantle the UUT.

g. **Analogue ATE**. An Analogue ATE is one which is used to perform tests on purely analogue circuitry.

h. **Combinational ATE**. A combinational ATE is one which provides both in-circuit and functional techniques. Such ATE tends to be aimed at UUTs which are of a hybrid nature, ie they contain both analogue and digital circuitry.

i. **General Purpose ATE (GPATE)**. The term 'General Purpose' in the context of ATE can be used in a number of ways. From the commercial standpoint, a GPATE is one that is marketed as a COTS system that can test a wide range of technologies and test subjects. In this sense, its use will not be limited to any particular project, and will typically be found at 2nd / 3rd line. However, within the MOD, the term GPATE can be used to describe an ATE procured to support a specific project with the ability to test other equipments. For these reasons, it is important to qualify the context in which the expression GPATE is used.

j. **Draft DEFSTAN**. TM ATS are in the process, assisted by industry and via the Standards Liaison Group for Automatic Test (SLGAT) of producing a DEFSTAN to assist the ILS manager in the procurement and requirement of Automatic Test Systems. This document should be available during 2008.

Automatic Test Systems Overview

3. Having detailed the different types of ATE this section now covers those aspects which affect the incorporation of those ATEs into a complete test system.

4. In general terms there are two additional elements which are required to turn the ATE into an ATS, namely:

a. **Interface Test Adaptor (ITA)**. The ITA is the interface which connects the UUT to the ATE Test Head. Other similar names, such as fixture, are used for this module which may contain a variety of active and passive circuitry to 'match' the UUT to the ATE.

b. **Test Program**. The test program is the application software that is used to control the tests, in sequence, for a particular UUT. A test program and interface test adaptor will together form a Test Program Set (TPS).

c. **Special Purpose ATS (SPATS)**. SPATS are those systems that are designed specifically for a particular test subject or limited range of UUTs. Projects are discouraged from procuring such systems because they invariably incur high acquisition and support costs.

5. One area where SPATS may be more appropriate is when it is used to test complex weapon systems when configured as an all-up round. Such testing involves interfacing with test facility safety and monitoring systems and requires internal monitoring of the ATS itself. The TPS design will also need to comply with MOD explosives processing regulations. That said, Integrated Project Teams (IPTs) should still be aware that such ATS could be used or adapted to test more than one weapon system.

6. **System Software**. All ATE will contain an operating system software package that provides the basic controlling function of the ATE. This software will provide the operator Visual Display Unit (VDU) interface.

7. **Application Software**. The application software is that software specifically designed to control the test sequence for a particular UUT. The generation of application software can be achieved in a number of ways, depending on the type of ATE and the nature of the test subject.

Current and Developing Technology

8. **General Purpose Interface Bus (GPIB)**. The GPIB, otherwise known as the IEEE-488 standard, is the well established industry standard for linking COTS instruments together in 'piggy-back' fashion. Nearly all commercially available instruments are now manufactured with a GPIB port accessed by the ATE controller.

9. **VXI Instrumentation**. Versa Module Eurocard (VME) eXtension for Instrumentation (VXI) is now the de-facto commercial standard for instrument-on-a-card technology with a large number of vendors working in partnership to evolve the standard under IEEE sponsorship.

10. **PXI Instrumentation**. Peripheral Component Interconnect (PCI) eXtension for Instrumentation (PXI) is formed by adding a modified VXI auxiliary signal to the compact PCI standard. It delivers a PC-based, standardised, high performance instrument.

11. **Interchangeable Virtual Instrument (IVI)**. IVI drivers define a new level of quality, completeness, usability, and functionality that reduces the cost of test system development and ownership. IVI drivers simplify the task of upgrading or replacing instruments in complex test systems and help preserve the test software.

12. **Synthetic Instrumentation (SI)**. This is a relatively new technology. Synthetic instruments emulate the stimulus and measurement capabilities found in traditional instruments through a combination of software algorithms and hardware modules that are based on core test instrumentation circuit building blocks. The technology enables a 'Tester on a Pin' approach to provide simultaneous Source / Measure capability. It employs multiple parallel analogue channels and therefore, reduces the need for switching and enables capability to perform analogue parallel test techniques.

13. **Virtual Super Instrument (VSI)**. It is described as the temporary creation of dynamic complex functions from the co-ordinated operation of a number of instruments which by themselves cannot produce the complex function required. It is used to produce Special-to-Type Test Equipment instrument functionality eg Identification Friend or Foe (IFF), Instrument Landing System (ILS), Tactical Air Navigation Aid (TACAN). VSI technology reduces the effects of obsolescence, can replace bulky specialist test sets and the system is transportable between ATSs.

14. **Boundary Scan**. Boundary Scan was developed in the mid-1980s to solve physical access problems on integrated circuits caused by increasingly crowded assemblies due to novel packaging technologies. It embeds test circuitry at chip level to form a complete board-level test protocol. It accesses complex assemblies for testing, debugging and in-system device programming and for diagnosing hardware problems.

Procurement and Funding of Automatic Test Systems

15. ATS procurement is the responsibility of individual IPTs and such procurement will be subject to Acquisition Operating Framework (AOF) principles, Support Solutions Envelope guidance, together with the information given in this document.

16. The service life of the ATS will often be in excess of 20 years and it must be remembered that technology, test and measurement techniques, capabilities and requirements will continue to evolve during that time. The ATS, therefore, must be capable of evolving with technology and emerging requirements and this is particularly relevant in the General Purpose ATS (GPATS) area. Inability to extend the parametric test envelope to encompass new test requirements might force projects to replace the existing ATS with a Special to Type ATS. Therefore, it is vital that all ATS test solutions are developed around open architecture systems.

17. Another issue which must be considered at this stage is that of IPR. The adoption of an open system approach will ensure that application software will be produced in a language that is non-proprietary and as such will be easier to re-host on any system changes which emerge from the inevitable obsolescence issues which will arise during the life of the ATS. The move towards Contractor Logistic Support (CLS) contracts also makes IPR an important issue. It is MOD Policy that any such contracts placed must have clear exit strategies for both parties. Such strategies will only be effective if MOD has access to all the data necessary to resubmit the contract to Tender action.

18. All potential ATS procurement is to be referred to DES SE TLS-TM-ATS who, in conjunction with individual IPTs will provide advice on the choice of ATS architecture to be used. Hence, IPT ILS managers are to consult with TM ATS at the earliest opportunity, who will assist in identifying suitable ATS either already in use or those about to enter service. IPTs are not to embark on any procurement without considering sharing test platforms with other projects. Managed properly there should be little or no need to procure additional capability unless there is no other way of satisfying the operational requirement.

19. Where an IPT has determined that a 1st to 4th line support solution, underpinned with a CLS contract, will be implemented, it is essential that the ATS complies with the requirements of this document. If this is not achieved then MOD will be unable to realise effective exit strategies from such CLS contracts.

Automatic Test Systems (ATS) Introduction into Service

20. The maintenance policy for all new ATS is to be produced in accordance with Logistic Support Analysis (LSA) processes. It is the responsibility of the IPT to determine, fund and arrange the maintenance and support of the ATS. The IPT is to ensure that the repair and calibration arrangements are well defined and established before the in-service date for the ATS. If the IPT is using an existing ATS, then funding of maintenance and support activities may be provided by / negotiated with the appropriate ATS owner.

21. All supply management activity (including requisition action) associated with the procurement and support of ATS is the responsibility of individual IPTs.

Support of Automatic Test Systems (ATS) Software

22. ATS require software to function. This software requires disciplined support including the provision of proper configuration control and documentation. It is recognised that some ATS software generated some time ago, in perhaps a less well disciplined environment, may not stand the test of being managed in accordance with present day disciplines. Nonetheless, those responsible for such software should endeavour to apply the procedures set out in this Section.

23. The Abbreviated Test Language for All Systems (ATLAS), as defined by the IEEE 716 standard, has been the MOD preferred language for expressing the test specifications of systems and associated sub-systems. As a result of the work carried out by the ATLAS Working Group and the IEEE Standards Co-ordinating Committee (SCC20) a new IEEE Standard (IEEE1641) - Signal Test Definition (STD), has been proposed. All new requirements should therefore include the need to use the STD standard. There are a large number of legacy systems that still use ATLAS and the need to maintain the ATLAS standard, via the ATLAS Working Group, will remain.

24. The MOD is not concerned with the internal software that drives micro-processor-based test and measurement instrumentation; it is almost certainly proprietary to the manufacturer of the instrumentation and not available at any cost. The MOD is only concerned with the external capability of such equipment, its ability to perform the required functions to the required tolerances and its configuration management.

Configuration Management

25. As previously stated, technology, test and measurement techniques, capabilities and requirements may all evolve during the service life of the ATS and the equipment being tested. The need for ATS in general, and GPATS in particular, to meet new or changed customer requirements will inevitably mean that such ATS will be subject to a number of changes to hardware and software and this issue needs to be carefully managed.

26. Effective Configuration Management between ATS, TPS and dependent prime equipment is critical. The test system will only work effectively if compatible build standards are employed.

27. It is the responsibility of each IPT to ensure that such a configuration management system is in place. DEFSTAN 05-57 ‘Configuration Management Policy and Procedures for Defence Material’ refers.

Automatic Test Systems (ATS) Diagnostics

28. The complexity of modern electronic equipment imposes increasingly difficult demands when determining the serviceability of equipment. Having established that the equipment is unserviceable it is then vital that an economical and speedy repair is affected to return the equipment to the user.

29. There will always be the need for an overall system test to confirm that the equipment meets an agreed level of performance. The depth to which the system is tested and the frequencies of tests are a matter of engineering judgement for each project.

30. An ideal aim is to set the designer the task of designing the equipment in such a way that diagnosis to an economically replaceable / disposable section of the equipment is simple and cost effective to achieve. Clearly this process also lends itself to several iterations as the design of the equipment evolves.

Risk Management

31. The guidance in this document has been developed to highlight the risks associated with rapid advances in technology and consequent obsolescence issues. It is aimed at helping IPTs to evaluate whole life costs more accurately and to enable the formulation of clear exit strategies from any contracts that may be placed as part of the support strategy.

Calibration

32. The design and construction of ATE varies considerably according to the application it supports and therefore each ATE will have its own particular calibration and maintenance requirement. These will be established by ILS / LSA processes. However the calibration should conform to the quality requirements laid down in chapters 5 & 6 of this document and follow the guidance in DEF STAN 05-55.

Safety

33. The safety of personnel using the ATS procured in support of any project is of paramount importance. The onus for assuring such safety aspects lies firmly with the IPTs.

34. The ATS procured or updated must be safe to use, maintain and be compatible with its working environment. It must not compromise Unit under Test (UUT) safety and must leave the UUT in a defined, safe state upon completion of the test or the identification of a failure.

35. IPTs are required to obtain evidence of compliance against current Health and Safety regulations and, where applicable, MOD Explosives Processing Regulations.

36. An ATS Safety case must be produced by the IPT.

Training

37. Health and Safety legislation mandates that adequate training must be given on the introduction of any new equipment in the workplace. It is the IPT's responsibility to ensure that such training is identified and implemented.

Automatic Test Systems Working Group (ATS WG)

38. When TM ATS was formed, it was based on the ATS group within the Sea environment, which meant that the expertise on the Land and Air equipment remained within those environments. To ensure that Air and Land perspectives play a full part in the determination of Policy and the future convergence of procedures and processes, an ATS Working Group (WG) has been formed. The ATS WG is chaired by TM ATS and is attended by representatives of DG Log (Strike) and DG Log (Land). The Terms of Reference (TORs) are included at Figure 1.

Figure 1: Terms of Reference for Automatic Test Systems Working Group

AUTOMATIC TEST SYSTEMS WORKING GROUP - TERMS OF REFERENCE

1. **Title.** Automatic Test Systems (ATS) Working Group (WG).

2. **Composition:**

The WG will be chaired by Test & Measurement TM / ATS.
The Secretary will be provided by the Chairman.
C1 / C2 level representatives from:

DG S&E
DG Log (Land)
DG Log (Strike)

Other members may be co-opted as required.

3. **Aim / Purpose.** To ensure sensible convergence of individual Services' policies and processes related to Automatic Test Systems, into an effective tri-service solution.

4. **Scope:**

To review current ATS related documentation and determine how it can be moved forward to a tri-service publication.

To review current ATS related processes and determine if they can be amalgamated to provide one tri-service application.

To identify and record the current ATS inventory in database format.

To maintain a close liaison with Industry.

To identify and share best practice.

To continually review advances in ATS technology.

5. **Reporting.** To TMG and individual line management.

6. **Frequency of Meetings.** Four per year.

CHAPTER 4 - SUPPLY AND MANAGEMENT OF GENERAL PURPOSE TEST & MEASUREMENT EQUIPMENT

Test Equipment (TE) and Subordinate Organisations

1. Test Equipment (TE) is part of the Deployable Support & Test Equipment IPT (DSTE). It has been tasked with providing and managing Defence TE.

2. TE is in turn sub-divided into two organisations, these are:

   a. Test Equipment Procurement (TEP).

   b. Test Equipment Management (TEM).

3. TE has adopted a phased approach to assuming responsibility for the management of all GPTME in the MOD. This document states the policy for the management of GPTME and leads to the uptake of further items of GPTME from individual Business Support Teams, Agencies and DE&S Integrated Project Teams (IPTs).

Customers

4. TE is to provide the following services to the customers listed below:

   a. **Directors of Equipment Capability**. Advice to Capability Areas, particularly for major equipment acquisition, when constructing the forward equipment programme, and also for subsequent replacement acquisition and upgrades.

   b. **Defence Equipment & Support**. Advice for equipment acquisition, both before and after the In-Service Date (ISD). Provide advice and assistance on GPTME and SPTME to IPTs through being a TME Centre of Excellence, along with offering a consolidated purchasing system for GPTME. TE is responsible for the provision, but not necessarily the funding and the management, of GPTME to agencies and organisations within the DE&S, in accordance with the provisions of this policy. The management and funding of operating costs are the responsibilities of TE after the ISD. Throughout the life of equipment, Integrated Logistics Support Managers (ILSMs) within IPTs are to liaise with TE to ensure that IPT decisions benefit from the collective commercial support arrangements which TE can offer. Furthermore, ILSMs must take into account the broader, whole life support implications of GPTME.

   c. **Front Line and Training Commands**. The provision and management of GPTME in accordance with the provisions of this policy and the processing of requests for GPTME and applications, where there is no supporting IPT, eg training.

Management Responsibilities

5. TE will manage all GPTME within the MOD within the sub sections of that branch. These management responsibilities for GPTME include:

   a. **Requirement**. Identification of a requirement is to be in accordance with the selection process at Paragraphs 14-16.

   b. **Procurement**. TEP will provide initial acquisition, including codification, ranging and scaling and publications of new items of equipment.

c. **Censuses**. When necessary, TEM may initiate a census to ascertain the holdings of serially numbered GPTME assets. In the longer term, it may be possible for TEM to carry out asset tracking.

d. **Repair and Calibration**. TEM will progress requests for calibration and respond to Defect Reports. GPTME will be calibrated to a Calibration Statement of Requirement (CSOR) or other DSTE approved document, by an accredited organisation.

e. **Configuration Control**. TEM will ensure configuration control of build standard for all GPTME is maintained.

f. **In-Service Asset Management**. TEM will provide asset management, which includes the staffing of Post Design Services (PDS), modifications, meeting Quality Assurance Reviewers' requirements and tasking of Stores Inspection Organisations.

g. **Controlling Loans**. TEM will have overall control of both inter-unit loans and loans to industry of GPTME.

h. **Training**. The requirement and cost for training, determined through either a project or TEM sponsored Training Needs Analysis (TNA), is normally included in the procurement price and funding will come from whoever funds procurement. TEM may arrange funding for the training of instructors at training establishments when new equipment enters Service.

i. **Disposal**. TEM will determine when an asset or line item is to be declared obsolescent or obsolete.

6. TEM will manage GPTME using the existing stock control system employed by each Service in accordance with current policy. At equipment ISD, responsibility for management of GPTME associated with that equipment would transfer to TEM, along with appropriate resources.

Catalogue of TEM Managed GPTME

7. For all GPTME used within the MOD (whether already in Service, or newly procured), TE will incorporate details, derived from the specification of the instruments in service, in JSP509 (MOD Catalogue of GPTME). The JSP509 will be progressively expanded in this way. JSP509 is available on the TEM website and a concise version on CD-ROM is available for use internally and for issue to industry.

Support

8. Taking due regard of specific recommendations, particularly from manufacturers or customers (usually IPTs), TE support will address (but will not be limited to) the following requirements:

a. Repair and the location of where it will take place.

b. Routine maintenance requirements.

c. Packaging and handling.

9. When producing their own equipment support publications and maintenance procedures, IPTs are not to refer to specific equipment models; they are to use generic terminology which refers to the measurement requirement. Advice and assistance will be provided by DSTE.

Selection of New GPTME

10. The initial requirement for GPTME, and any subsequent requirements, are to be raised in accordance with existing Logistics Support Analysis (LSA) procedures in consultation with DSTE.

11. GPTME to fulfil a particular task is to be selected using the following criteria, in order of precedence:

a. An item of GPTME which is in-service, and therefore features in JSP509, or is subject to TE procurement action.

b. An item of GPTME which is in-service, but a modification to the GPTME item and / or the procurement of an additional accessory is required. Cost effectiveness of the modification or accessory procurement must be demonstrated.

c. An item of GPTME which is not currently in-service but is to be purchased as Commercial Off The Shelf (COTS) equipment from trade.

d. An item of TME which is developed through funded research and is subsequently declared as either GPTME or SPTME.

e. If SPTME is selected, it will be procured and managed by the appropriate IPT. However the use of SPTME should be avoided to minimise the proliferation of in-service TME.

12. Advice on the selection of TME must in all circumstances be obtained from DSTE prior to making a final selection decision. To allow DSTE to determine the most appropriate GPTME to meet a test or measurement need, the customer is to describe the requirement using performance specifications, rather than quoting a particular manufacturer's model type.

Procurement of GPTME

13. To avoid unnecessary proliferation of GPTME used within the MOD and to gain the benefits of centralised procurement provisioning and - re-provisioning for GPTME is to be conducted by DSTE. Alternatively IPTs, must demonstrate at the approval stage that their own sourcing is more cost-effective for the MOD as a whole. When provisioning or re-provisioning to meet a new requirement, the customer (usually an IPT) is to make sufficient funding available to DSTE to purchase and initially support the item.

14. Re-provisioning to meet established ongoing requirements and long term support is the responsibility of DSTE.

15. Provision of GPTME by DSTE to meet a new or additional requirement will be achieved by one of the following methods:

a. Using GPTME from a range that is currently in-service, by arranging an issue from stock or by obtaining additional stock for issue by taking re-provisioning action.

b. Procurement of suitable GPTME from trade, where the item has not previously been held in inventory.

c. Development of a new model of GPTME.

Asset Management

16. DSTE will maintain a database of asset configuration to assist efficient fleet management. This database can be interrogated and viewed through the MOD intranet at www.temo.dlo.r.mil.uk/. Any GPTME accountable to RAB is to be managed in accordance with JSP472.

Through Life Costing

17. It is MOD Policy to minimise through-life costs, and one aspect of this policy is the reduction in the proliferation of TME through the greater utilisation of GPTME. IPTs are also to maximise the use of GPTME as opposed to SPTME, and only use SPTME after seeking advice from DSTE.

18. ILSMs within IPTs, are to address GPTME through-life issues by liaising directly with DSTE. DSTE will monitor through life costs and when GPTME is declared beyond economic repair, will initiate disposal and replacement action.

Commercial

19. DSTE will procure GPTME in accordance with MOD commercial procedures.

Scaling

20. Each Business Support Team or Agency is responsible for setting scales of GPTME to be used within their Environments. When Business Support Team identify a justified requirement for an increase in scale, the ESBU or Agency creating the change in scale is to provide funding to DSTE to cover the additional procurement and support environment.

Customer Support Standards

21. DSTE is to maintain Business Support Team baseline service levels and to honour KPIs in existing Business Support Team Customer Supplier Agreements (CSAs) that directly relate to user / supplier requirements. MG has created CSAs, covering the agreed levels of support standards with its customers, as part of the annual CSA re-negotiations. Health and Safety.

Health and Safety

22. In accordance with Secretary of State's Environmental & Safety Policy and DE&S Environment & Safety Management Framework, equipment safety and Health & Safety requirements are to be complied with by Business Support Team. JSP509 will include any specific safety requirements.

23. DEFSTAN 00-56 / 2, JSP454(Land), JSP430(Sea), and JSP318B(Air) detail the mechanisms by which Safety Cases are raised for each equipment. GPTME is procured with a Conformation European (CE) marking. It is the responsibility of the user IPT to release the relevant Safety Case for how and where the GPTME is to be used. DSTE provides advice on the construction of a suitable Safety Case and help in obtaining any supporting documentation that is required.

24. DSTE can advise on the selection of a suitable contractor to provide a formal Safety Assessment as part of the introduction into service of new GPTME. Individual IPTs who wish to use GPTME outside the assessed safe operating parameters should consult with DSTE. Any subsequent change to the Assessment, to address their specific requirements, will be the responsibility of the IPT.

CHAPTER 5 - CALIBRATION OF TEST & MEASUREMENT EQUIPMENT

POLICY

1. Responsibility for Calibration Policy is vested in the MOD. This responsibility is discharged by DES SE TLS-TM, who is responsible for the evolution and implementation of Tri-service Calibration Policy.

2. DES SE TLS-TM is to control and improve the quality of the calibration process and provides a means of audit and critique of that process. DES SE TLS-TM also provides guidance and assurance on all aspects of Defence measurement and calibration and will conduct assessments of calibration laboratory competence and performance capability on behalf of the MOD.

Intent

3. To provide direction to the Defence community on the criteria to be followed for the Calibration of TME used in support of the Armed Services.

Scope

4. This policy applies to all projects involved in the procurement and in-service support of TME requiring calibration. It is integral to the directives contained within the All projects are to adopt this policy.

Aims

5. In the short term this policy will provide a cohesive approach to the development of common calibration solutions for existing TME.

6. In the longer term it will lead to the adoption of a common approach across DE&S and in so doing will increase interoperability between Services' support equipment, allowing the advantages of commonality to lead to increased efficiency in the provision of support.

Implementation

7. Organisations and users involved in the procurement and in-service support of TME requiring calibration should consult DES SE TLS-TM:

a. To establish if calibration can be better achieved, more cost effectively, utilising the centralised calibration contracts with Trading Funds at DARA Sealand and ABRO Donnington.

b. To ensure that the TME calibration requirement is properly defined.

c. Prior to raising any contracts with Industry for calibration of TME in order for DES SE TLS-TM to evaluate suitability of calibration laboratory to undertake the proposed task.

Traceability

8. All equipment used for tests and / or calibrations, including equipment for subsidiary measurements (eg for environmental conditions), which could have a significant effect on the accuracy or validity of the result of the test, calibration or sampling, shall be calibrated before being put into service in the MOD.

9. Laboratories are to be selected to ensure that claimed capabilities match the requirements of the TME to be calibrated.

10. The preferred option for calibration by Industry is that Laboratories are accredited by United Kingdom Accreditation Service (UKAS) to ISO 17025.

11. Laboratories not accredited by UKAS to ISO 17025 are required to demonstrate their competence and performance capability. DEFSTAN 05-55 refers.

12. All standards and measurement equipment shall be calibrated using standards traceable to National (or International) standards.

Measurement Limits

13. All measurements, whether made for purposes of calibration or product characteristic assessment, are to take into account the total error in the measurement process for each parameter measured. The total error is to include errors attributable to the standard or measuring equipment, personnel, procedure and environment. The total error is to be no more than 25% of the limits for each specified measurement. The measurements are to have an associated uncertainty level of 95%.

EQUIPMENT GUIDANCE

Introduction

14. Calibration and testing of MOD TME will be undertaken through the use of Trading Funds, contracts with Industry, (including National Standards Laboratories), in-Theatre calibration laboratories or front line Unit Level Test.

Traceability

15. **Calibration via Trading Funds**. DSTE administers, on behalf of the MOD, single customer contracts with Trading Funds for calibration of TME. Within the UK use of these contracts is the preferred option.

a. ABRO Donnington as the centre of excellence for mechanical TME.

b. DARA Sealand as the centre of excellence for electrical TME.

16. **Northern Calibration Facility (NCF), HMNB (Clyde)**. NCF, HMNB (Clyde) is the approved Trident Calibration Facility. Under an agreement between DLO HQ and Commodore Clyde, all Clyde-based TME is to be calibrated in this laboratory. TME used in support of Trident Project is owned and sponsored by CSSE / StratSys IPT and is calibrated to quality standards and calibration procedures agreed under the Treaty between UK and US Governments.

17. **Overseas Support**. In-Theatre calibration support for overseas units is to be directed through the appropriate MOD in-Theatre calibration laboratory.

18. **Calibration via Industry**:

a. **UKAS Accredited Laboratories**. The internationally recognised standard for competence of laboratories is ISO / IEC 17025 and is the standard against which UKAS accredits laboratories. UKAS is the sole accreditation body recognised by the British Government as authorised to assess commercial calibration laboratories for competence, and performance capability, against internationally recognised standards. The use of UKAS-approved laboratories selected to ensure that claimed capabilities match the requirements of the TME to be calibrated is therefore the preferred option for calibration by Industry.

b. **Non UKAS Accredited Laboratories**. Laboratories not accredited by UKAS to ISO 17025 will be required to demonstrate their competence and performance for their declared schedule of capability. ISO 9000:2000 standards only relate to the laboratory's quality management system and does not specifically evaluate the technical competence of a laboratory and should never be confused with ISO 17025 or thought of as an acceptable alternative. Certification against ISO 9001:2000 does not of itself demonstrate the competence of the laboratory to produce technically valid data and results.

c. **International**. Through the International Laboratory Accreditation Cooperation (ILAC) accredited calibration laboratories that are assessed and recognised as being competent to ISO 17025 are accepted for the calibration of TME in-Theatre.

19. **UK National Physical Laboratory or Foreign Standards Laboratories**. In order to avoid unnecessary expense, calibration and testing of TME by the UK National Physical Laboratory or Foreign Standards Laboratories may be undertaken only in the following circumstances:

a. The scope and uncertainty required cannot be met by other laboratories.

b. The traceability to a National Measurement Standard cannot be met by other laboratories.

c. When using other Foreign Standards Laboratories, they must be recognised by means of a Memorandum of Understanding (MOU) with the UK National Physical Laboratory, which will guarantee the maintenance of appropriate and equivalent standards.

20. **Calibration via In-Theatre Laboratories**. DSTE sponsor the measurement capability and provide direction to the In-Theatre calibration laboratories to provide a iTri-Service focus for In-Theatre calibration support. The management of these calibration laboratories is to be in accordance with the requirements of BS EN ISO 9001:2000 incorporating BS EN ISO 10012:2003. The laboratories are to operate in accordance with DEFSTAN 05-55. These calibration laboratories are established at:

a. Army Calibration Laboratory, Bielefeld, Germany.

b. Cyprus Calibration and Electronic Repair Workshop, RAF Akrotiri.

c. 46 Workshop REME, NICSS Regiment, Northern Ireland.

d. Joint Logistics Unit, HM Naval Base Gibraltar.

Assessment and Monitoring of Calibration Laboratories

21. **UKAS Accredited**. UKAS laboratories that have been accredited for the scope and uncertainty required to meet the requirements of the TME do not need to be assessed as this has already been undertaken by UKAS or its international equivalent as a part of their accreditation.

22. **Non-UKAS Accredited**. All non-accredited calibration laboratories are to be assessed to demonstrate their competence and performance for the scope and uncertainty required to meet the requirements of the TME. DEFSTAN 05-55 refers.

23. **In-Theatre Laboratories**. DES SE TLS-TM will conduct assessments of In-Theatre calibration laboratory competence and performance capability on behalf of MOD.

24. **Unit Level Test**. Certain TME may be periodically tested to a limited cardinal point specification, or checked between calibration intervals at User Unit Level. Testing should be conducted in accordance with a DES SE TLS-TM approved Unit Level Test Procedure, using suitable transfer standards and suitably trained personnel. Competence of Front Line Units to conduct tests will be assessed by DES SE TLS-TM sponsored loop audit.

Responsibility, Authority and Communication

25. **IPTs**. IPTs, in conjunction with DES SE TLS-TM, are responsible for determining the following:

a. Type of TME to meet desired performance specification (using TEM-sponsored JSP509 equipment, where possible).

b. TME calibration requirements.

c. Monitoring the provision of calibration procedures, specifications and measurement standards where required for in-service calibration in association with DES SE TLS-TM.

d. Arranging the whole life funding of industry contracts for equipment designated for contract calibration.

26. **Command Headquarters TME Responsibilities**. Command Headquarters are responsible for the co-ordination of all TME calibration matters, including transport, packaging, storage, etc, within their establishments and units. They are to ensure that TME is calibrated in accordance with this policy.

27. **Unit Responsibilities**. Beyond normal TME usage and management some units will have parenting responsibility for Theatre calibration laboratories.

Calibration Specifications and Critical Parameters

28. A Calibration Statement of Requirement (CSOR) will be issued by DES SE TLS-TM for all TME. It will specify the cardinal point specification and accuracy requirements for

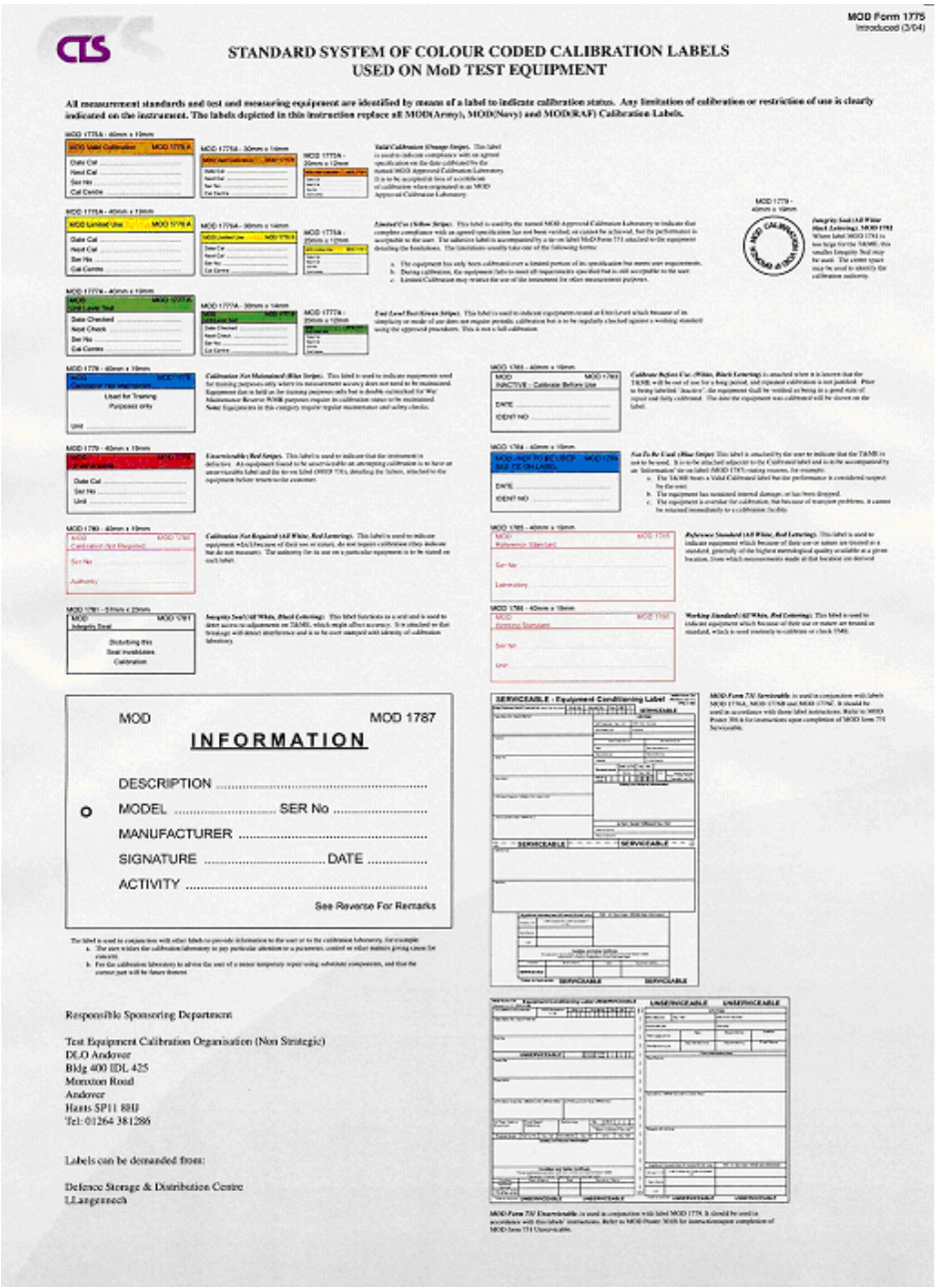
which measurements are to be made to ensure that the TME complies with the manufacturers' claimed performance specification, and any additional requirements unique to the MOD. Where applicable a CSOR will:

a. Specify functional tests to confirm the serviceability of the TME.

b. Specify calibration requirements when a CSOR is used as part of a purchase contract technical requirement.

29. The calibration of certain SPTME may require the use of special calibration techniques or purpose built test aids. In these cases DES SE TLS-TM will sponsor and control an Instrument Calibration Procedure (ICP) fully detailing the calibration equipment, procedure and requirements.

Figure 2: MOD Form 1775 – Standard System of Colour Coded Calibration Labels used on MOD Test Equipment



Reporting the Results

30. The calibration status and serviceability of all measurement standards and TME are to be identified by means of a suitable calibration label.

31. For equipment calibrated within a MOD Calibration Laboratory, labels to be used are to be in accordance with MOD Form 1775 as illustrated at Figure 2.

32. These labels are to be accepted by the user unit as Certificates of Conformance. However, if specific equipment is designated by the unit as a Working or Reference Standard, the Unit TME Controller is to ensure that the MOD calibration laboratory is aware of the requirement to supply a Calibration Certificate by boldly annotating the calibration notification form accompanying the TME. Full calibration results will be held by the laboratory for a minimum of three calibration intervals and may be supplied on request.

33. All contracts with Industry are to include the requirement to supply a certificate of calibration including a statement of compliance for all TME calibrated. When statements of compliance are made, the uncertainty of measurement shall be taken into account. A suitable calibration label should also be applied to indicate compliance.

Reporting of Failures

34. MOD calibration laboratories will report adjustment or critical feature failures to the user using the comments box on the MOD Form 731, Equipment Conditioning Label, which is returned with all TME after calibration.

35. On receipt of adjustment or critical feature failures, it is the user's responsibility to assess the impact that any such condition may have had on previous test or measurements conducted.

Calibration Intervals

36. With the exception of parameters maintained by natural physical constants, no item of TME remains in a constant state. TME is therefore to be calibrated at periodic intervals to preserve the integrity of measurements performed.

37. Initially the calibration interval of TME will be recommended at the Calibration Assessment. Except for SWS owned TME & IPT owned SPTME, the responsibility for setting calibration intervals for all TME lies with DES SE TLS-TM. Through analysis of calibration results and failure trends, DES SE TLS-TM may adjust the calibration interval to ensure the required accuracy is maintained between calibration intervals.

38. Calibration intervals are specified within JSP509, which is promulgated within the Test Equipment Management (TEM) website.

Exempting Calibrateable TME from Calibration

39. In principle, all TME will be used to support engineering tasks, and therefore used in the assessment of output product quality to support a unit's mission. It should not normally be exempt from calibration requirements.

40. Unit specialist officers (engineering) may consider that local usage (eg training or non-mission critical) is such that there is no need to calibrate TME which are shown in JSP509 as being subject to periodic calibration.

41. It is possible that identical TME may be approved for different purposes arising within the same unit; in such circumstances, calibration exemption may apply only to a specific item serial number for a specific usage or purpose. If TME is exempted from the calibration requirements then the holding unit is to ensure that it is not used to carry out measurements which affect product quality, or measurements intended to demonstrate conditions of safety of personnel, inadvertently or otherwise.

TME Used in Training Environment

42. In order to effect cost savings and improve equipment availability, where equipment is used for training purposes only, following assessment by a specialist Engineering Officer, then functional checks, Unit Level Test, or Calibration Not Required (CNR) may be used in lieu of returning equipment to calibration laboratory for recertification. Any such equipment should be clearly annotated “Training Use Only” (MOD Form 1775 refers).

TME Subject to Extension for Use Beyond Calibration Validity Dates

43. It is MOD policy that TME is not to be used for any purpose once its calibration due date has expired. Due to operational requirements an extension may be necessary to use TME beyond its calibration due date. The application for, and approval of a calibration extension is to be an EXCEPTIONAL rather than a ROUTINE procedure. A specialist engineering officer may grant an extension, up to a maximum of 25% of the declared Calibration Interval in accordance with local control procedures, provided application is made prior to calibration due date.

Calibration Problem Reporting

44. Any difficulties may be referred to DES SE TLS-TM using MOD Form 1796 Calibration Problem Report Form.