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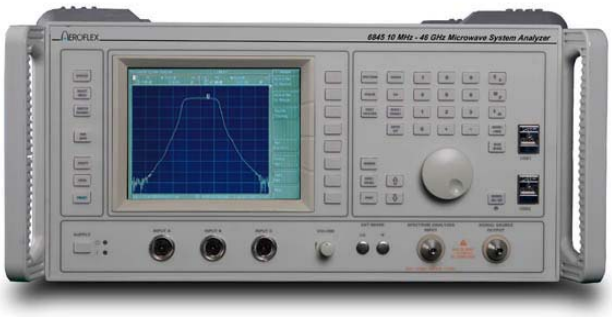
MICROWAVE GENERATOR

6810A SERIES



Operating and Remote Programming Manual

Document part no. 46892/931

MICROWAVE GENERATORS
6810A SERIES

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About this manual

This manual explains how to use the 6810A Series microwave generators.

Intended Audience

Persons engaged on work relating to the design and manufacture of RF and microwave sub-systems and modules, or the installation and maintenance of those systems.

It is assumed that the reader will be familiar with the terms used in RF and microwave measurements.

Structure

Chapter 1

Provides an introduction to the 6810A Series instruments. It also includes complete performance data and lists the versions, options and accessories available.

Chapter 2

Installation details, including connecting to an AC supply, goods-in checks and routine maintenance

Chapter 3

Illustrates the features of the instrument and describes manual operation from the front panel.

Chapter 4

Describes remote operation using GPIB.

Chapter 5

Brief technical description and block diagram of the instrument.

Chapter 6

Acceptance testing procedures to verify that the instrument is functioning correctly.

Document conventions

The following conventions apply throughout this manual:

CAPS	Capitals are used to identify names of controls and panel markings.
[CAPS]	Capitals in square brackets indicate hard key titles.
[Italics]	Italics in square brackets indicate soft key titles.
[Averaging ●]	A '●' after a soft key title indicates that the key has a toggle action, and that the function is enabled.
[Averaging ○]	A '○' after a soft key title indicates that the key has a toggle action, and that the function is disabled.

Associated publications

There is another publication covering specific aspects of this equipment:

- **Service Manual** (46880/122). Optional purchase providing information for maintenance, adjustment, calibration and repair.

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Precautions

WARNING **CAUTION** **Note**

These terms have specific meanings in this manual:

WARNING **information to prevent personal injury.**

CAUTION **information to prevent damage to the equipment.**

Note **important general information.**

Symbols

The meaning of hazard symbols appearing on the equipment and in the documentation is as follows:

Symbol	Description
	Refer to the operating manual when this symbol is marked on the instrument. Familiarize yourself with the nature of the hazard and the actions that may have to be taken.
	Dangerous voltage
	Toxic hazard
	Static sensitive components

General conditions of use

This product is designed and tested to comply with the requirements of IEC/EN61010-1 'Safety requirements for electrical equipment for measurement, control and laboratory use', for Class I portable equipment and is for use in a pollution degree 2 environment. The equipment is designed to operate from an installation category II supply.

Equipment should be protected from the ingress of liquids and precipitation such as rain, snow, etc. When moving the equipment from a cold to a hot environment, it is important to allow the temperature of the equipment to stabilize before it is connected to the supply to avoid condensation forming. The equipment must only be operated within the environmental conditions specified in Chapter 1 'Performance data' in the Operating Manual, otherwise the protection provided by the equipment may be impaired.

This product is not approved for use in hazardous atmospheres or medical applications. If the equipment is to be used in a safety-related application, e.g. avionics or military applications, the suitability of the product must be assessed and approved for use by a competent person.

WARNING

Electrical hazards (AC supply voltage)

This equipment conforms with IEC Safety Class I, meaning that it is provided with a protective grounding lead. To maintain this protection the supply lead must always be connected to the source of supply via a socket with a grounded contact.

Be aware that the supply filter contains capacitors that may remain charged after the equipment is disconnected from the supply. Although the stored energy is within the approved safety requirements, a slight shock may be felt if the plug pins are touched immediately after removal.

Do not remove instrument covers as this may result in personal injury. There are no user-serviceable parts inside.

Refer all servicing to qualified personnel. See list of Service Centers at rear of manual.

Fuses

Note that there are supply fuses in both the live and neutral wires of the supply lead. If only one of these fuses should rupture, certain parts of the equipment could remain at supply potential.

WARNING

Fire hazard

Make sure that only fuses of the correct rating and type are used for replacement.

If an integrally fused plug is used on the supply lead, ensure that the fuse rating is commensurate with the current requirements of this equipment. See Chapter 1 for power requirements.

WARNING

Toxic hazards

Some of the components used in this equipment may include resins and other materials which give off toxic fumes if incinerated. Take appropriate precautions, therefore, in the disposal of these items.

WARNING

Beryllium copper

Some mechanical components within this instrument are manufactured from beryllium copper. This is an alloy with a beryllium content of approximately 5%. It represents no risk in normal use.

The material should not be machined, welded or subjected to any process where heat is involved.

It must be disposed of as “special waste”.

It must NOT be disposed of by incineration.

WARNING

Lithium

A Lithium battery (or a Lithium battery contained within an IC) is used in this equipment.

As Lithium is a toxic substance, the battery should in no circumstances be crushed, incinerated or disposed of in normal waste.

Do not attempt to recharge this type of battery. Do not short circuit or force discharge since this might cause the battery to vent, overheat or explode.

WARNING

Heavy equipment

The weight of the 6813 Series exceeds the 18 kg (40 lb) guideline for manual handling by a single person. To avoid the risk of injury, an assessment should be carried out prior to handling which takes account of the load, workplace environment and individual capability, in accordance with European Directive 90/269/EEC and associated National Regulations.

WARNING

Tilt facility

When the equipment is in the tilt position, it is advisable, for stability reasons, not to stack other equipment on top of it.

CAUTION

Static sensitive components

This equipment contains static sensitive components which may be damaged by handling - refer to the Maintenance part of the Service Manual for handling precautions.

CAUTION

Precision connector

The precision microwave connectors fitted to this equipment may be damaged by mating with a non-precision type. Damage to the connector may also occur if the connector interface parameters are not within specification. The connector should be checked with the appropriate gauging tool.

CAUTION

Suitability for use

This equipment has been designed and manufactured by Aeroflex to perform measurements on RF and microwave components and systems.

If the equipment is not used in a manner specified by Aeroflex, the protection provided by the equipment may be impaired.

Aeroflex has no control over the use of this equipment and cannot be held responsible for events arising from its use other than for its intended purpose.

Précautions

WARNING **CAUTION** **Note**

Les termes suivants ont, dans ce manuel, des significations particulières:

WARNING contient des informations pour éviter toute blessure au personnel.

CAUTION contient des informations pour éviter les dommages aux équipements.

Note contient d'importantes informations d'ordre général.

Symboles signalant un risque

La signification des symboles de danger apparaissant sur l'équipement et dans la documentation est la suivante:

Symbole	Nature du risque
	Reportez-vous au manuel d'utilisation quand ce symbole apparaît sur l'instrument. Familiarisez-vous avec la nature du danger et la conduite à tenir.
	Tension dangereuse
	Danger produits toxiques

Conditions générales d'utilisation

Ce produit a été conçu et testé pour être conforme aux exigences des normes CEI/EN61010-1 "Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire", pour des équipements Classe I portables et pour une utilisation dans un environnement de pollution de niveau 2. Cet équipement est conçu pour fonctionner à partir d'une alimentation de catégorie II.

Cet équipement doit être protégé de l'introduction de liquides ainsi que des précipitations d'eau, de neige, etc... Lorsqu'on transporte cet équipement d'un environnement chaud vers un environnement froid, il est important de laisser l'équipement se stabiliser en température avant de le connecter à une alimentation afin d'éviter toute formation de condensation. L'appareil doit être utilisé uniquement dans le cadre des conditions d'environnement spécifiées dans 'Performance data' dans le chapitre 1 du manuel d'utilisation, toute autre utilisation peut endommager les systèmes de protection.

Ce produit n'est pas garanti pour fonctionner dans des atmosphères dangereuses ou pour un usage médical. Si l'équipement doit être utilisé pour des applications en relation avec la sécurité, par exemple des applications militaires ou aéronautiques, la compatibilité du produit doit être établie et approuvée par une personne compétente.

WARNING

Sécurité électrique (tension d'alimentation alternative)

Cet appareil est protégé conformément à la norme CEI de sécurité Classe 1, c'est-à-dire que sa prise secteur comporte un fil de protection à la terre. Pour maintenir cette protection, le câble d'alimentation doit toujours être branché à la source d'alimentation par l'intermédiaire d'une prise comportant une borne de terre.

Notez que les filtres d'alimentation contiennent des condensateurs qui peuvent encore être chargés lorsque l'appareil est débranché. Bien que l'énergie contenue soit conforme aux exigences de sécurité, il est possible de ressentir un léger choc si l'on touche les bornes sitôt après débranchement.

Ne démontez pas le capot de l'instrument, car ceci peut provoquer des blessures. Il n'y a pas de pièces remplaçables par l'utilisateur à l'intérieur.

Faites effectuer toute réparation par du personnel qualifié. Contacter un des Centres de Maintenance Internationaux dans la liste jointe à la fin du manuel.

Fusibles

Notez qu'il y a deux fusibles, l'un pour la phase et l'autre pour le neutre du câble d'alimentation. Si un seul fusible est coupé, certaines parties de l'appareil peuvent rester au potentiel d'alimentation.

WARNING

Risque lié au feu

Lors du remplacement des fusibles vérifiez l'exactitude de leur type et de leur valeur.
Si le câble d'alimentation comporte une prise avec fusible intégré, assurez vous que sa valeur est compatible avec les besoins en courant de l'appareil. Pour la consommation, reportez vous au chapitre 1 du manuel d'utilisation.

WARNING

Danger produits toxiques

Certains composants utilisés dans cet appareil peuvent contenir des résines et d'autres matières qui dégagent des fumées toxiques lors de leur incinération. Les précautions d'usages doivent donc être prises lorsqu'on se débarrasse de ce type de composant.

WARNING

Bronze au béryllium

Dans cet équipement,certaines pièces mécaniques sont à base de bronze au béryllium. Il s'agit d'un alliage dans lequel le pourcentage de béryllium ne dépasse pas 5%. Il ne présente aucun danger en utilisation normale.
Toutefois, cet alliage ne doit pas être travaillé, soudé ou soumis à un processus qui implique l'utilisation d'une source de chaleur.
En cas de destruction, il sera entreposé dans un container spécial. IL ne devra pas être détruit par incinération

WARNING

Lithium

Une pile au Lithium ou un CI contenant une pile au Lithium est utilisé dans cet équipement.
Le Lithium étant une substance toxique, il ne faut en aucun cas l'écraser, l'incinérer ou le jeter avec des déchets normaux.
N'essayez pas de recharger ce type de pile. Ne court-circuitez pas ou ne forcez pas la décharge de la pile car cela pourrait causer une fuite, une surchauffe ou une explosion.

WARNING

Equipement lourd

Le poids des appareils du 6813 Serie est supérieur à la limite de 18 kg (40 lb), fixée pour le transport par une seule personne. Afin d'éviter tout risque de blessure, il est nécessaire de faire, avant le transport, une évaluation de la charge, des contraintes de l'environnement et des capacités de l'individu, en conformité avec la Directive Européenne 90/269/EEC ainsi que les recommandations Nationales concernées.

WARNING

Position inclinée

Lorsque l’appareil est dans une position inclinée, il est recommandé, pour des raisons de stabilité, de ne pas y empiler d’autres appareils.

CAUTION

Utilisation

Cet équipement a été conçu et fabriqué par Aeroflex pour effectuer des mesures sur des composants et des systèmes RF et hyperfréquences.

La protection de l'équipement peut être altérée s'il n'est pas utilisé dans les conditions spécifiées par Aeroflex.

Aeroflex n'a aucun contrôle sur l'usage de l'instrument, et ne pourra être tenu pour responsable en cas d'événement survenant suite à une utilisation différente de celle prévue.

Vorsichtsmaßnahmen

WARNING **CAUTION** **Note**

Diese Hinweise haben eine bestimmte Bedeutung in diesem Handbuch:

WARNING **dienen zur Vermeidung von Verletzungsrisiken.**

CAUTION **dienen dem Schutz der Geräte.**

Note **enthalten wichtige Informationen.**

Gefahrensymbole

Die Bedeutung der Gefahrensymbole auf den Geräten und in der Dokumentation ist wie folgt:

Symbol	Gefahrenart
	Beziehen Sie sich auf die Bedienungsanleitung wenn das Messgerät mit diesem Symbol markiert ist. Machen Sie sich mit der Art der Gefahr und den Aktionen die getroffen werden müssen bekannt.
	Gefährliche Spannung
	Warnung vor giftigen Substanzen

Allgemeine Hinweise zur Verwendung

Dieses Produkt wurde entsprechend den Anforderungen von IEC/EN61010-1 “Sicherheitsanforderungen für elektrische Ausrüstung für Meßaufgaben, Steuerung und Laborbedarf”, Klasse I transportabel zur Verwendung in einer Grad 2 verunreinigten Umgebung, entwickelt und getestet. Dieses Gerät ist für Netzversorgung Klasse II zugelassen.

Das Gerät sollte vor dem Eindringen von Flüssigkeiten sowie vor Regen, Schnee etc. geschützt werden. Bei Standortänderung von kalter in wärmere Umgebung sollte das Gerät wegen der Kondensation erst nach Anpassung an die wärmere Umgebung mit dem Netz verbunden werden. Das Gerät darf nur in Umgebungsbedingungen wie im Kapitel 1 ‘Leistungsdaten (Performance data)’ der Bedienungsanleitung beschrieben, betrieben werden; ansonsten wird der vom Gerät vorgesehene Schutz des Anwenders beeinträchtigt.

Dieses Produkt ist nicht für den Einsatz in gefährlicher Umgebung (z.B. Ex-Bereich) und für medizinische Anwendungen geprüft. Sollte das Gerät für den Einsatz in sicherheitsrelevanten Anwendungen wie z.B. im Flugverkehr oder bei militaerischen Anwendungen vorgesehen sein, so ist dieser von einer für diesen Bereich zuständigen Person zu beurteilen und genehmigen.

WARNING

Elektrische Schläge (Wechselspannungsversorgung)

Das Gerät entspricht IEC Sicherheitsklasse 1 mit einem Schutzleiter nach Erde. Das Netzkabel muß stets an eine Steckdose mit Erdkontakt angeschlossen werden.

Filterkondensatoren in der internen Spannungsversorgung können auch nach Unterbrechung der Spannungszuführung noch geladen sein. Obwohl die darin gespeicherte Energie innerhalb der Sicherheitsmargen liegt, kann ein leichter Spannungsschlag bei Berührung kurz nach der Unterbrechung erfolgen.

Öffnen Sie niemals das Gehäuse der Geräte das dies zu ernsthaften Verletzungen führen kann. Es gibt keine vom Anwender austauschbare Teile in diesem Gerät.

Lassen Sie alle Reparaturen durch qualifiziertes Personal durchführen. Eine Liste der Servicestellen finden Sie auf der Rückseite des Handbuches.

Sicherungen

Es ist zu beachten, daß es Sicherungen in beiden (spannunsführenden und neutralen) Zuleitungen gibt. Wenn nur eine von diesen Sicherungen schmilzt, so bleiben einige Geräteteile immer noch auf Spannungspotential.

WARNING

Feuergefahr

Es dürfen nur Ersatzsicherungen vom gleichen Typ mit den korrekten Spezifikationen entsprechend der Stromaufnahme des Gerätes verwendet werden. Siehe hierzu Kapitel 1.

WARNING

Warnung vor giftigen Substanzen

In einigen Bauelementen dieses Geräts können Epoxyharze oder andere Materialien enthalten sein, die im Brandfall giftige Gase erzeugen. Bei der Entsorgung müssen deshalb entsprechende Vorsichtsmaßnahmen getroffen werden.

WARNING

Beryllium Kupfer

In diesem Gerät sind einige mechanische Komponenten aus Berylium Kupfer gefertigt. Dies ist eine Verbindung welche aus einem Berylliumanteil von ca. 5 % besteht. Bei normaler Verwendung besteht kein Gesundheitsrisiko.

Das Metall darf nicht bearbeitet, geschweißt oder sonstiger Wärmebehandlung ausgesetzt werden.

Es muß als Sondermüll entsorgt werden.

Es darf nicht durch Verbrennung entsorgt werden.

WARNING

Lithium

Eine Lithium Batterie oder eine Lithium Batterie innerhalb eines IC ist in diesem Gerät eingebaut.

Da Lithium ein giftiges Material ist, sollte es als Sondermüll entsorgt werden.

Diese Batterie darf auf keinen Fall geladen werden. Nicht kurzschließen, da sie dabei überhitzt werden und explodieren kann.

WARNING

Schweres Gerät

Das Gewicht der 6813 Series Geräte liegt über der 18 kg (40 lb) Grenze für Transport durch eine einzelne Person. Zur Vermeidung von Verletzungen sollten vor einem Transport die Arbeitsumgebung und die persönlichen Möglichkeiten im Verhältnis zur Last abgewogen werden, wie in der EU-Regelung 90/269/EEC und nationalen Normen beschrieben.

WARNING

Schrägstellung

Bei Schrägstellung des Geräts sollten aus Stabilitätsgründen keine anderen Geräte darauf gestellt werden.

CAUTION

Eignung für Gebrauch

Dieses Gerät wurde von Aeroflex entwickelt und hergestellt um Messungen an HF- und Mikrowellenkomponenten und -Systemen durchzuführen.

Sollte das Gerät nicht auf die von Aeroflex vorgesehene Art und Weise verwendet werden, kann die Schutzfunktion des Gerätes beeinträchtigt werden.

Aeroflex hat keinen Einfluß auf die Art der Verwendung und übernimmt keinerlei Verantwortung bei unsachgemässer Handhabung.

Precauzioni

WARNING **CAUTION** **Note**

Questi termini vengono utilizzati in questo manuale con significati specifici:

WARNING **riportano informazioni atte ad evitare possibili pericoli alla persona.**

CAUTION **riportano informazioni per evitare possibili pericoli all'apparecchiatura.**

Note **riportano importanti informazioni di carattere generale.**

Simboli di pericolo

Il significato del simbolo di pericolo riportato sugli strumenti e nella documentazione è il seguente:

Simbolo	Tipo di pericolo
	Fare riferimento al manuale operativo quando questo simbolo è riportato sullo strumento. Rendervi conto della natura del pericolo e delle precauzioni che dovrete prendere.
	Tensione pericolosa
	Pericolo sostanze tossiche

Condizioni generali d'uso

Questo prodotto è stato progettato e collaudato per rispondere ai requisiti della direttiva IEC/EN61010-1 'Safety requirements for electrical equipment for measurement, control and laboratory use' per apparati di classe I portatili e per l'uso in un ambiente inquinato di grado 2. L'apparato è stato progettato per essere alimentato da un alimentatore di categoria II.

Lo strumento deve essere protetto dal possibile ingresso di liquidi quali, ad es., acqua, pioggia, neve, ecc. Qualora lo strumento venga portato da un ambiente freddo ad uno caldo, è importante lasciare che la temperatura all'interno dello strumento si stabilizzi prima di alimentarlo per evitare formazione di condense. Lo strumento deve essere utilizzato esclusivamente nelle condizioni ambientali descritte nel capitolo 1 'Performance data' del manuale operativo, in caso contrario le protezioni previste nello strumento potrebbero risultare non sufficienti.

Questo prodotto non è stato approvato per essere usato in ambienti pericolosi o applicazioni medicali. Se lo strumento deve essere usato per applicazioni particolari collegate alla sicurezza (per esempio applicazioni militari o avioniche), occorre che una persona o un istituto competente ne certifichi l'uso.

WARNING

Pericoli da elettricità (alimentazione c.a.)

Quest 'apparato è provvisto del collegamento di protezione di terra e rispetta le norme di sicurezza IEC, classe 1. Per mantenere questa protezione è necessario che il cavo, la spina e la presa d'alimentazione siano tutti provvisti di terra.

Il circuito d'alimentazione contiene dei filtri i cui condensatori possono restare carichi anche dopo aver rimosso l'alimentazione. Sebbene l'energia immagazzinata è entro i limiti di sicurezza, purtuttavia una leggera scossa può essere avvertita toccando i capi della spina subito dopo averla rimossa.

Non rimuovete mai le coperture perché così potreste provocare danni a voi stessi. Non vi sono all'interno parti di interesse all'utilizzatore.

Tutte gli interventi sono di competenza del personale qualificato. Vedi elenco internazionale dei Centri di Assistenza in fondo al manuale.

Fusibili

Notare che un fusibile è posto sul filo caldo del cavo di alimentazione. Qualora l'alimentazione avvenga tramite due poli non polarizzati, è possibile che il fusibile vada a protezione del neutro per cui anche in caso di una sua rottura, l'apparato potrebbe restare sotto tensione.

WARNING

Pericolo d'incendio

Assicurarsi che, in caso di sostituzione, vengano utilizzati solo fusibili della portata e del tipo prescritti.
Se viene usata una spina con fusibili, assicurarsi che questi siano di portata adeguata ai requisiti di alimentazione richiesti dallo strumento. Tali requisiti sono riportati nella scheda tecnica (di seguito al capitolo 1).

WARNING

Pericolo sostanze tossiche

Alcuni dei componenti usati in questo strumento possono contenere resine o altri materiali che, se bruciati, possono emettere fumi tossici. Prendere quindi le opportune precauzioni nell'uso di tali parti.

WARNING

Rame berillio

Alcuni componenti meccanici in questo strumento sono realizzati in rame berillio. Si tratta di una lega con contenuto di berillio di circa il 5%, che non presenta alcun rischio in usi normali.

Questo materiale non deve essere lavorato, saldato o subire qualsiasi processo che coinvolge alte temperature.

Deve essere eliminato come "rifiuto speciale". Non deve essere eliminato tramite "inceneritore".

WARNING

Litio

Quest 'apparato incorpora una batteria al litio o un circuito integrato contenente una batteria al litio.

Poiché il litio è una sostanza tossica, la batteria non deve essere mai né rotta, né incenerita, né gettata tra i normali rifiuti.

Questo tipo di batteria non può essere sottoposto né a ricarica né a corto-circuito o scarica forzata. Queste azioni possono provocare surriscaldamento, fuoriuscita di gas o esplosione della batteria.

WARNING

Strumento pesante

Il peso degli strumenti serie 6800 supera i 18 kg (40 lb) raccomandati come limite per il trasporto manuale da parte di singola persona. Per evitare rischi di danni fisici è bene quindi considerare il carico complessivo, le condizioni del trasporto e le capacità individuali in accordo con la direttiva comunitaria 90/269/EEC e con eventuali regolamenti locali.

WARNING

Posizionamento inclinato

Quando lo strumento è in posizione inclinata è raccomandato, per motivi di stabilità, non sovrapporre altri strumenti.

CAUTION

Caratteristiche d’uso

Questo strumento è stato progettato e prodotto da Aeroflex eseguire misure su componenti o sistemi RF e microonde.

Se lo strumento non è utilizzato nel modo specificato da Aeroflex, le protezioni previste sullo strumento potrebbero risultare inefficaci.

Aeroflex non può avere il controllo sull’uso di questo strumento e non può essere ritenuta responsabile per eventi risultanti da un uso diverso dallo scopo prefisso.

Precauciones

WARNING **CAUTION** **Note**

Estos términos tienen significados específicos en este manual:

WARNING **contienen información referente a prevención de daños personales.**

CAUTION **contienen información referente a prevención de daños en equipos.**

Note **contienen información general importante.**

Símbolos de peligro

El significado de los símbolos de peligro en el equipo y en la documentación es el siguiente:

Símbolo	Naturaleza del peligro
	Vea el manual de funcionamiento cuando este símbolo aparezca en el instrumento. Familiarícese con la naturaleza del riesgo y con las acciones que deban de tomarse.
	Voltaje peligroso
	Aviso de toxicidad

Condiciones generales de uso

Este producto ha sido diseñado y probado para cumplir los requerimientos de la normativa IEC/EN61010-1 “Requerimientos de la normativa para equipos eléctricos de medida, control y uso en laboratorio”, para equipos clase I portátiles y para uso en un ambiente con un grado de contaminación 2. El equipo ha sido diseñado para funcionar sobre una instalación de alimentación de categorías II.

Debe protegerse el equipo de la entrada de líquidos y precipitaciones como nieve, lluvia, etc. Cuando se traslada el equipo de entorno frío a un entorno caliente, es importante aguardar la estabilización el equipo para evitar la condensación. Solamente debe utilizarse el equipo bajo las condiciones ambientales especificadas en el Capítulo 1 ‘Especificaciones’ o ‘Performance data’ del Manual de Instrucciones, en caso contrario la propia protección del equipo puede resultar dañada.

Este producto no ha sido aprobado para su utilización en entornos peligrosos o en aplicaciones médicas. Si se va a utilizar el equipo en una aplicación con implicaciones en cuanto a seguridad, como por ejemplo aplicaciones de aviónica o militares, es preciso que un experto competente en materia de seguridad apruebe su uso.

WARNING

Nivel peligroso de electricidad (tensión de red)

Este equipo cumple las normas IEC Seguridad Clase 1, lo que significa que va provisto de un cable de protección de masa. Para mantener esta protección, el cable de alimentación de red debe de conectarse siempre a una clavija con terminal de masa.

Tenga en cuenta que el filtro de red contiene condensadores que pueden almacenar carga una vez desconectado el equipo. Aunque la energía almacenada está dentro de los requisitos de seguridad, pudiera sentirse una ligera descarga al tocar la clavija de alimentación inmediatamente después de su desconexión de red.

No retire las cubiertas del chasis del instrumento, ya que pudiera resultar dañado personalmente. No existen partes que puedan ser reparadas en su interior.

Deje todas las tareas relativas a reparación a un servicio técnico cualificado. Vea la lista de Centros de Servicios Internacionales en la parte trasera del manual.

Fusibles

Se hace notar que el Equipo está dotado de fusibles tanto en el activo como el neutro de alimentación. Si sólo uno de estos fusibles fundiera, existen partes del equipo que pudieran permanecer a tensión de red.

WARNING

Peligro de incendio

Asegúrese de utilizar sólo fusibles del tipo y valores especificados como repuesto.

Si se utiliza una clavija con fusible incorporado, asegúrese de que los valores del fusible corresponden a los requeridos por el equipo. Consulte Capítulo 1 para comprobar los requisitos de alimentación.

WARNING

Aviso de toxicidad

Alguno de los componentes utilizados en este equipo pudieran incluir resinas u otro tipo de materiales que al arder produjeran sustancias tóxicas, Por tanto, tome las debidas precauciones en la manipulación de esas piezas.

WARNING

Berilio-cobre

Algunos componentes mecánicos contenidos en este instrumento incorporan berilio-cobre en su proceso de fabricación. Se trata de una aleación con un contenido aproximado de berilio del 5%, lo que no representa ningún riesgo durante su uso normal.

El material no debe ser manipulado, soldado, ni sometido a ningún proceso que implique la aplicación de calor.

Para su eliminación debe tratarse como un "residuo especial". El material NO DEBE eliminarse mediante incineración.

WARNING

Litio

En este equipo se utiliza una batería de litio (o contenida dentro de un CI).

Dada que el litio es una substancia tóxica las baterías de este material no deben ser aplastadas, quemadas o arrojadas junto a basuras ordinarias.

No trate de recargar este tipo de baterías. No las cortocircuite o fuerce su descarga ya que puede dar lugar a que la esta emita gases, se recaliente o explote.

WARNING

Instrumento pesado

El peso de los equipos Serie 6800 es superior a la recomendación de 18 Kg (40 lb), lo que debe tenerse en cuenta. si va ser transportado manualmente por una sola persona. Para evitar el riesgo de lesiones, antes de mover el equipo deberá evaluar la carga, el entorno de trabajo y la propia capacidad, de acuerdo con la Directiva Europea 90/269/EEC y el Reglamento Nacional Asociado.

WARNING

Tener en cuenta con el equipo inclinado

Si utiliza el equipo en posición inclinada, se recomienda, por razones de estabilidad, no apilar otros equipos encima de él.

CAUTION

Idoneidad de uso

Este equipo ha sido diseñado y fabricado por Aeroflex para realizar medidas en RF y microondas en componentes y sistemas.

Si el equipo fuese utilizado de forma diferente a la especificada por Aeroflex, la protección ofrecida por el equipo pudiera quedar reducida.

Aeroflex no tiene control sobre el uso de este equipo y no puede, por tanto, exigirsele responsabilidades derivadas de una utilización distinta de aquellas para las que ha sido diseñado.

Chapter 1
GENERAL INFORMATION

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Purpose and features of equipment

Introduction

6810A Series instruments are portable microwave synthesized frequency sources:

6813A	Microwave Synthesized Generator	10 MHz to 20 GHz
6815AR	Microwave Synthesized Generator	10 MHz to 40 GHz
6815A	Microwave Synthesized Generator	10 MHz to 46 GHz

Typical applications for these instruments are:

- providing the local oscillator for mixer measurements;
- radar system sensitivity testing via an external pulse modulator e.g. 6146, 6147;
- as a high frequency interfering source for testing wireless systems.

Main features

Synthesized source

The 6810A Series uses a fully synthesized frequency source for precision sweeps with high resolution and frequency stability and low phase noise. The source also provides an accurate CW output and a list mode is available via the menu system. A power sweep mode is provided for gain compression testing. Power level is settable over a 20 dB range with a maximum guaranteed levelled power of +10 dBm for all frequencies.

The source can be frequency modulated in CW mode using a suitable external modulating signal. An internal modulating signal is also available if the Internal FM option is fitted. If the Pulse Modulator option is fitted, external pulse modulation is possible. If both Internal FM generator and Pulse Modulator options are fitted, internal and external FM and pulse modulation are possible.

Optional 70 dB and 90 dB (6813A only) step attenuators are available to set low output powers for small signal applications.

Other features

Non-volatile stores are provided for the storage of instrument settings including frequency lists for list mode.

User interface

The firmware controls the functions of the synthesized source. Operator interaction with the system is performed using a liquid crystal display (LCD) and the front panel controls. Menus, instructions, error messages and help text are displayed on the LCD, and menu selection is accomplished using a set of eight soft keys adjacent to the display.

The source setup is defined using a simple menu system. All commonly accessed functions are no more than one level down in the menu tree structure so that the instrument operation is easily learnt.

Non-volatile storage is provided for instrument settings for future use.

As an alternative to using the front panel to control the instrument's functions, an external IBM-compatible keyboard can be connected via a standard keyboard interface. International support for keyboards is provided.

Display

The display is a TFT colour LCD with a resolution of 640 × 480 pixels. A rear-panel connector is available for connecting an external standard VGA colour monitor.

Remote operation

Remote control commands are provided enabling full control of the system via the GPIB interface. The GPIB complies with IEEE 488.2 and follows the SCPI convention (Standard Commands for Programmable Instrumentation). The commands also enable the instrument to be controlled via the RS-232 (serial) interface.

Data storage

The 6810A Series has internal non-volatile memory that can be used for instrument settings and calibrations. To store results separately from the instrument there are two USB ports.

User calibrations

At temperatures outside the range +20 to +30°C (68 to 86°F), the performance of the instruments can be optimized by performing user calibrations. This facility is available via the [UTILITY] menu and selecting: [Service] [Instrument Calibrations]. A menu covering the RF source calibration is available. In the menu, a facility exists to perform a 'Frequency Calibration' and this should be utilized when the 'Unloc' indicator appears at the top of the screen.

If performing the frequency calibration does not clear the 'Unloc' indicator, then consult your local service center.

Performance data – 6810A Series

Source

Functionality	Synthesized CW Synthesized sweeper for use with scalar analyzer CW power sweep Frequency list mode External frequency modulation Optional internal frequency modulation, FM + pulse driver (Option 023) Optional internal pulse modulator (Option 025)
Frequency Range	
6813A	10 MHz to 20 GHz
6815AR	10 MHz to 40 GHz
6815A	10 MHz to 46 GHz
Resolution (Settable)	
6813A	1 Hz to 20 GHz
6815A	1 Hz to 46 GHz
CW Accuracy	(Frequency Standard error x Frequency) ± 10 Hz
Swept Accuracy (Typical)	
300 µs Step Time	
10 MHz to 3 GHz	<20 kHz
3 GHz to 46 GHz	<200 kHz
1 ms Step Time	
10 MHz to 3 GHz	<1 kHz
3 GHz to 46 GHz	<10 kHz
10 ms Step Time	
10 MHz to 3 GHz	<100 Hz
3 GHz to 46 GHz	<1 kHz
List Mode Step Time	
<500 µs minimum step time per point	
10 MHz to 3 GHz	<4 kHz
3 GHz to 46 GHz	<40 kHz
Leveled Power Range	
6813A	
10 MHz to 40 GHz	–10 dBm to +10 dBm
6815A	
10 MHz to 8 GHz	–10 dBm to +8 dBm, +10 dBm typical
8 GHz to 20 GHz	–10 dBm to +5 dBm, +7 dBm typical
6815AR	
20 GHz to 24 GHz	–10 dBm to +4 dBm, +6 dBm typical
24 GHz to 40 GHz	–10 dBm to 0 dBm, +3 dBm typical
40 GHz to 46 GHz	–10 dBm to 0 dBm typical (excluding the effect of connector moding)
6813A + Option 011 (70 dB Step Attenuator)	
10 MHz to 3 GHz	–80 dBm to +8 dBm
3 GHz to 20 GHz	–80 dBm to +7 dBm
6813A + Option 012 (90 dB Step Attenuator)	
10 MHz to 3 GHz	–100 dBm to +8 dBm
3 GHz to 24 GHz	–100 dBm to +7 dBm

6815A/15AR + Option 013 (70 dB Step Attenuator)	
10 MHz to 8 GHz	−10 dBm to +6 dBm, +8 dBm typical
8 GHz to 20 GHz	−10 dBm to +2 dBm, +4 dBm typical
20 GHz to 24 GHz	−10 dBm to +1 dBm, +3 dBm typical
24 GHz to 40 GHz	−10 dBm to −3 dBm, 0 dBm typical

Note: 1) For Option 002 (Field Replaceable Connectors) guaranteed leveled output is reduced by 0.5 dB.
2) For Option 025 (Internal Pulse Modulation) the guaranteed leveled output is reduced as detailed under the option's specification.

Settable Power Range	−101 dBm top +20 dBm dependent on attenuator option
Settable Power Resolution	0.01 dB
Power Sweep Range (from Maximum Leveled Power) without Attenuator	>20 dB
Internal Leveling Accuracy at 0 dBm (no options fitted)	
10 MHz to 3 GHz	±0.7 dB
3 GHz to 24 GHz	±1.0 dB
24 GHz to 40 GHz	±1.5 dB
Leveled Power Accuracy (with Options 011, 012, 013)	
1 MHz to 3 GHz	< ±1 dB (± 0.3 dB ± 2% of attenuator setting in dB, whichever is the greater)
3 GHz to 24 GHz	< ±1 dB (± 1 dB ± 4% of attenuator setting in dB, whichever is the greater)
24 GHz to 40 GHz	< ±1.5 dB (± 1 dB ± 4% of attenuator setting in dB, whichever is the greater)
Linearity (No Options Fitted) over Leveled Power Range Relative to 0 dBm	
1 MHz to 40 GHz	< ±0.5 dB
Power Stability with Temperature (typical)	
1 MHz to 40 GHz	< 0.1 dB/°C
Harmonics and Sub-Harmonics over Leveled Power Range	
Harmonics	
<70 MHz,	< −25 dBc
70 MHz to 3 GHz	< −55 dBc
3 GHz to 24 GHz	< −50 dBc
24 GHz to 40 GHz	< −20 dBc
Sub-Harmonics	
1 MHz to 3 GHz,	< −60 dBc
3 GHz to 20 GHz	None
20 GHz to 40 GHz	< −40 dBc
Spurious Signals (Typical)	
For carrier frequencies <375 MHz	
30 kHz to 150 kHz offset	< −50 dBc
> 150 kHz	< −55 dBc
For carrier frequencies >375 MHz	
30 kHz to 150 kHz offset	< −50 dBc
> 150 kHz	< −60 dBc

Phase Noise in dBc/Hz in CW mode (guaranteed)

CW Frequency	Frequency offset		
	1 kHz	10 kHz	100 kHz
0.25 GHz	–86	–95	–108
0.5 GHz	–98	–112	–134
1 GHz	–92	–106	–128
2 GHz	–86	–100	–122
4 GHz	–80	–92	–100
10 GHz	–72	–84	–90
20 GHz	–66	–78	–82
40 GHz	–63	–75	–79

Phase Noise in dBc/Hz in CW mode (typical)

CW Frequency	Frequency offset				
	100 Hz	1 kHz	10 kHz	100 kHz	1MHz
0.3 GHz	–88	–90	–101	–110	–135
0.6 GHz	–90	–99	–114	–130	–140
1 GHz	–87	–92	–109	–129	–140
3 GHz	–76	–86	–100	–120	–138
4 GHz	–75	–82	–97	–111	–120
6 GHz	–71	–80	–94	–101	–110
10 GHz	–68	–73	–87	–100	–110
20 GHz	–60	–74	–84	–93	–105
24 GHz	–58	–64	–76	–80	–103
40 GHz	–55	–63	–75	–79	–100

Source Match (Typical)

1 MHz to 3 GHz	< –15 dB
3 GHz to 20 GHz	< –10 dB
20 GHz to 40 GHz	< –8 dB

Output Connector

6813A	Precision N type, female (standard) or precision 3.5 mm, female (option)
6815A/15AR	Precision 2.92 mm female or field replaceable connectors (option)

External Frequency Modulation

Peak deviation (1 V peak output)

10 MHz–375 MHz	1 kHz to 5 MHz
375 MHz–750 MHz	250 Hz to 1.25 MHz
750 MHz–1.5 GHz	500 Hz to 2.5 MHz
1.5 GHz–3 GHz	1 kHz to 5 MHz
3 GHz–46 GHz	20 kHz to 1 MHz

Accuracy (1 kHz modulating frequency)

20–400 kHz deviation	Typical ± 3% of indication ± 1 Hz excluding residual FM

–3 dB bandwidth, AC coupled mode

10 MHz–3 GHz	< 100 Hz to > 1 MHz typical
3 GHz–46 GHz	< 100 Hz to > 500 kHz typical

–3 dB bandwidth, DC coupled mode

10 MHz–3 GHz	< DC to > 1 MHz typical
3 GHz–46 GHz	< DC to > 500 kHz typical

Frequency Modulation Option 023

Modulation signal	Sinewave, 0.1 Hz to 500 kHz Resolution 0.1 Hz

Other specifications as for External Frequency Modulation except:

Accuracy (1 kHz modulating frequency)	
20 - 400 kHz deviation	± 5% of indication ± 1 Hz excluding residual FM
Pulse Generator Source	
Modes	Single pulse
Pulse Pattern	Pulse patterns comprising up to 256 pulse width/PRI pairs can be set up, stored and recalled
Trigger Modes	External, internal continuous
Pulse Widths (PW)	120 ns to >1 s
Resolution	120 ns
Pulse Period (PRI)	240 ns to 7 s (PRF <1 Hz to 4.16 MHz)
Resolution	120 ns
Pulse Delay	Zero to 100 ms where zero is <120 ns referred to trigger or sync pulse falling edge
Resolution	120 ns
Sync Output	120 ns pulse referred to trigger. Available at trigger socket.
Inputs/Outputs	
Trigger in/out	Rear-panel BNC connector provides either trigger input or sync output dependent upon trigger mode. TTL level.
Options 025a & 025b Internal Pulse Modulator	
Option 025a (6813A)	
Frequency Range	50 MHz to 18 GHz. Usable to 20 GHz.
RF Output Range	The leveled power range is reduced by:
	<3 dB up to 6 GHz
	<4 dB up to 14 GHz
	<4.5 dB up to 18 GHz
	when pulse modulation is selected
RF Level Accuracy	Adds ± 0.3 dB to the levelled power accuracy specification when pulse modulation is enabled and for powers of <-1 dBm
Source Harmonics (with Pulse Modulation enabled)	
50 MHz – 2 GHz	<-35 dBc
2 GHz – 20 GHz	<-50 dBc
On/Off Ratio	
50 MHz – 1 GHz	>55 dB
1 GHz – 9 GHz	>60 dB
9 GHz – 17 GHz	>70 dB
17 GHz – 18 GHz	>80 dB
18 GHz – 20 GHz	>80 dB (typical)
Rise/Fall Times	(measured at 10% and 90% of edge)
Rise Time	<8 ns (typically <5 ns)
Fall Time	<12 ns (typically <9 ns)
Option 025b (6815A and 6815AR)	
Frequency Range	50 MHz to 40 GHz (24 GHz for 6815A)
RF Output Range	The leveled power range is reduced by:
	<4 dB up to 12 GHz
	<5 dB up to 20 GHz
	<6 dB up to 30 GHz
	<8 dB up to 40 GHz
	when pulse modulation is selected
RF Level Accuracy	Adds ± 0.3 dB to the levelled power accuracy specification when pulse modulation is enabled and for powers of <-3 dBm

Source Harmonics (with Pulse Modulation enabled)	
50 MHz – 375 MHz	<-40 dBc
375 MHz – 24 GHz	<-50 dBc
24 GHz – 40 GHz	<-20 dBc
On/Off Ratio	
50 MHz – 10 GHz	>60 dB
10 GHz – 26.5 GHz	>60 dB (typically >70 dB)
26.5 GHz – 40 GHz	>60 dB (typically >80 dB)
Rise/Fall Times	(measured at 10% and 90% of edge)
Rise Time	<7 ns (typically <6 ns)
Fall Time	<11 ns (typically <10 ns)
Pulse Modulation Control	
Modes	Pulse, Pulse CW External (via rear-panel BNC connector) Internal (if Option 023 is fitted)
Control	Control of pulse modulation is: Internal via soft key menu when the modulation generator option (Option 023) is fitted or External via the rear-panel BNC Mod In/Out socket Level is TTL, High = On, Low = Off When pulse mod Off is selected, the output is the selected CW output level
Pulse CW	In both internal or external modes, allows setting of output level in the On condition for reference or calibration.

Frequency Standard

Internal 10 MHz OCXO	
Drift	± 5 in 10^8 over 0 to 55°C
Ageing	± 2 in 10^7 per year (OCXO)
External Frequency Standard	1 MHz or 10 MHz, via BNC connector

Rear Panel Connectors

RS-232	9-way D-type connector, male Baud rate 300 to 9600
GPIB Interface	GPIB is IEEE 488.1 and 488.2 compatible.
Frequency Standard	1 or 10 MHz input or 10 MHz output selectable from front panel. BNC connector.
Mod In/Out	Frequency modulation input or output. Impedance approx. 100 Ω. BNC connector
External Monitor	Standard VGA, 640 by 480 colour output 15-way high density D-type female connector
Voltage Output (Auxiliary 9-pin connector)	Settable for 0 to 10 V ramp, fixed voltage
External Leveling Input	
Input voltage range	0 to +1 V
Connector	BNC (f)

Trigger Board Option 24

External Trigger Input	
Connector	BNC (f) TTL input to trigger sweep in frequency list mode
Lock Output	
Connector	BNC (f) TTL output indicating source locked

General Features

Display	Color active matrix TFT liquid crystal display with 16.5 cm (6.5 in) visible diagonal
Data Storage and firmware upgrade	USB ports (two)
Weight — Model and Option dependent	16 kg (35 lb)
Size (not including front handles)	230 mm H x 430 mm W x 570 mm D (9 in H x 17 in W x 22 in D)
Power Supply	Auto-sensing 90 V to 265 V, 45 Hz to 65 Hz AC. 90 V to 110 V, 400 Hz AC. Consumption 150 W
Rated Range of Use	
Temperature	6813: 0 to +50°C (32 to 122°F) 6815: +5 to +45°C (+9 to 113°F)
Humidity	Up to 93% RH at +40°C
Conditions of Storage and Transportation	
Temperature	–40 to +71°C (–40 to +160°F)
Humidity	Up to 93% RH at +40°C (+104°F)
Altitude	Up to 4570 m (15000 ft)
Electromagnetic Compatibility	Conforms to the protection requirements of EEC Council directive 2004/108/EC. Conforms to the limits specified in the following standards: IEC/EN61326-1 : 2006 RF Emission Class A, Immunity table 3. The instrument is intended for use in industrial environments. It may not be possible to ensure electromagnetic compatibility in other environments because of conducted or radiated disturbances. The instrument is intended for use in a controlled electromagnetic environment. If RF transmitters such as mobile telephones are used in close proximity, performance of the instrument may be affected.
Safety	Conforms with the requirements of EC Council Directive 2006/95/EC (as amended) and product standard IEC/EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for class 1 portable equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an installation category 2 supply.

Note: All specifications quoted are for operation at calibration temperature ±3°C (±5.4°F).
Specifications involving Type N connectors above 18 GHz are not traceable to national standards as these do not exist at present.
Specifications involving 2.92 mm connectors above 40 GHz are not traceable to national standards as these do not exist at present.
Typical specifications are non-warranted.

Versions, options and accessories – 6810A Series

Versions – Microwave Synthesized Generators

6813A	10 MHz to 20 GHz Synthesized Generator
6815AR	10 MHz to 40GHz Synthesized Generator
6815A	10 MHz to 46GHz Synthesized Generator

Options

002	Field Replaceable Precision N (f) and 3.5 mm (f) RF connectors (6813A), 2.92 mm (f) 6815A, 6815AR
011	20 GHz 70 dB Step Attenuator (available only for 6813A)
012	26.5 GHz 90 dB Step Attenuator (available only for 6813A)
013	40 GHz 70 dB Step Attenuator (available only for 6815A)
023	Internal Modulation
024	Trigger Board
025	Internal Pulse Modulator (Opt 25a 6813A), (Opt 25b 6815AR)

Supplied Accessories

46886/067	CD-ROM containing:
46892/920	6820A/6840A Series Operating Manual
46892/922	6810A and 6820A/6840A Series Getting Started Guide
46892/921	6820A/6840A Series Remote Operating Manual
46892/931	6810A Series Operating/Remote Programming Manual
43123/076	AC Supply Lead
37591/755	Front Panel Cover

Optional accessories

6230A/L Scalar Detectors (for level calibration)

6230A Series	Standard detectors (–65 dBm to +20 dBm) typical

Miscellaneous Electrical Cables

43129/189	GPIB Cable
43139/042	BNC (m) to BNC (m) 1.5 m

Standard Microwave Cables

54351/022	0.5 m, 18 GHz, N (m) to N (m)
54351/025	0.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)
54351/027	0.5 m, 40 GHz, 2.92 mm (m) to 2.92 mm (m)

Attenuators

56534/901	Precision Fixed Coaxial Attenuator 3 dB DC to 18 GHz 5 W, N (m) to N (f)
56534/902	Precision Fixed Coaxial Attenuator 6 dB DC to 18 GHz 5 W, N (m) to N (f)
56534/903	Precision Fixed Coaxial Attenuator 10 dB DC to 18 GHz 5 W, N (m) to N (f)
56534/904	Precision Fixed Coaxial Attenuator 20 dB DC to 18 GHz 5 W, N (m) to N (f)

Miscellaneous

46885/038	Rack Mount Kit for 6810A Series
46880/122	Service Manual (consists of maintenance manual (printed) + operating manual (CD-ROM))
46882/931	6810A Series Operating/Remote Programming Manual (printed)
46882/922	6810A and 6820A/6840A Series Getting Started Guide (printed)
84501	Soft Carrying Case
46662/695	Flight Case
54152/001	3.5 mm Torque Wrench
54211/008	Compact Keyboard

EC Declaration of Conformity

Refer to the manufacturer for a copy of the Declaration of Conformity for this instrument

Chapter 2
INSTALLATION

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WARNING

Initial visual inspection

After unpacking the equipment, inspect the shipping container and its cushioning material for signs of stress or damage. If damage is identified, retain the packing material for examination by the carrier in the event that a claim is made. Examine the equipment for signs of damage; do not connect the equipment to a supply when damage is present, internal electrical damage could result in shock if the equipment is turned on.

CAUTION

Installation requirements

Ventilation

This equipment is forced air cooled by a fan mounted on the rear panel. Air must be allowed to circulate freely through the ventilator grills located on the side and underside of the equipment. Before switching on the equipment, ensure that the air inlet on the rear panel is not restricted (i.e. clearance of at least 75 mm (3 in) at the rear, 25 mm (1 in) at each side, 15 mm (3/4 in) on the underside), or obstructed with loose material that could be sucked into the fan. Failure to provide adequate clearances will increase internal temperatures and reduce the equipment reliability, so its performance may not meet specification.

Class I power cords (3-core)

General

When the equipment has to be plugged into a Class II (ungrounded) 2-terminal socket outlet, the cable should either be fitted with a 3-pin Class I plug and used in conjunction with an adapter incorporating a ground wire, or be fitted with a Class II plug with an integral ground wire. The ground wire must be securely fastened to ground. Grounding one terminal on a 2-terminal socket will not provide adequate protection.

In the event that a molded plug has to be removed from a lead, it must be disposed of immediately. A plug with bare flexible cords is hazardous if engaged in a live socket outlet.

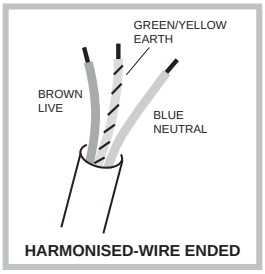
Power cords with the following terminations are available from Aeroflex. Please check with your local sales office for availability.

This equipment is provided with a 3-wire (grounded) cordset, which includes a molded IEC 320 connector for connection to the equipment. The cable must be fitted with an approved plug which, when plugged into an appropriate 3-terminal socket outlet, grounds the case of the equipment. Failure to ground the equipment may expose the operator to hazardous voltage levels. Depending upon the destination country, the color-coding of the wires will differ:

Wire ended

Country	IEC 320 plug type	Part number
Universal	Straight through	23424/158
Universal	Right angled	23424/159

	North America	Harmonized
Line (Live)	Black	Brown
Neutral	White	Blue
Ground (Earth)	Green	Green/Yellow



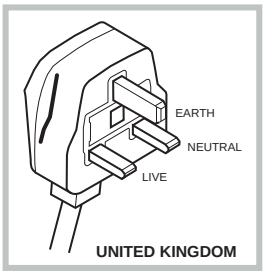
C3509

British

Country	IEC 320 plug type	Part number
United Kingdom	Straight through	23422/001
United Kingdom	Right angled	23422/002

The UK lead is fitted with an ASTA approved molded plug to BS 1363.

A replaceable 13 A fuse to BS 1362 is contained within the plug. This fuse is only designed to protect the lead assembly. Never use the plug with the detachable fuse cover omitted or if the cover is damaged.



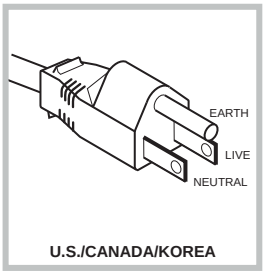
C3510

The fuse(s) or circuit breaker to protect the equipment is fitted at the back of the equipment.

North American

Country	IEC 320 plug type	Part number
North American	Straight through	23422/004
North American	Right angled	23422/005

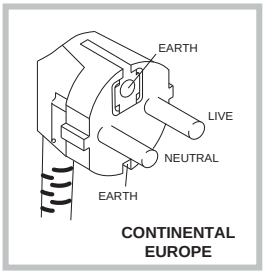
The North American lead is fitted with a NEMA 5-15P (Canadian CS22.2 No 42) plug and carries approvals from UL and CSA for use in the USA and Canada.



C3511

Continental Europe

Country	IEC 320 plug type	Part number
Europe	Straight through	23422/006
Europe	Right angled	23422/007



C3512

The Continental European lead is fitted with a right angle IEC83 standard C4 plug (CEE 7/7) that allows it to be used in sockets with either a male earth pin (standard C 3b) or side earth clips (standard C 2b) the latter is commonly called the German 'Schuko' plug. In common with other Schuko style plugs, the plug is not polarized when fitted into a Schuko socket. The lead carries approvals for use in Austria, Belgium, Finland, France, Germany, Holland, Italy, Norway and Sweden. Note that this plug will not fit Italian standard CEI 23-16 outlets. The lead should not be used in Denmark given that the earth connection will not be made.

Français

Le câble d'alimentation d'Europe Continentale est muni d'un connecteur mâle à angle droit type CEI83, standard C4 (CEE 7/7), qui peut être utilisé dans une prise femelle à ergot de terre (standard C 3b) ou à clips latéraux (standard C 2b), cette dernière étant communément appelée prise "Schuko" allemande. De la même façon que les autres connecteurs de type Schuko, celui-ci n'est pas polarisé lorsqu'il s'adapte à une prise femelle Schuko. Ce câble d'alimentation est homologué en Allemagne, Autriche, Belgique, Finlande, France, Hollande, Italie, Norvège et Suède. A noter que ce connecteur n'est pas compatible avec les prises de courant italiennes au standard CEI 23-16. Ce câble ne doit pas être utilisé au Danemark à cause du défaut de connexion de masse.

Deutsch

Das kontinentaleuropäische Netzkabel ist mit einem rechtwinkeligen Stecker nach IEC83 C4 (CEE7/7) Standard versehen, welcher sowohl in Steckdosen mit Erde-Stift (Standard C 3b) oder seitlichen Erdeklemmen, im allgemeinen "Schukosteckdose" genannt, paßt. Üblicherweise ist der Schukostecker bei Verwendung in Schukosteckdosen nicht gepolt. Dieses Netzkabel besitzt Zulassung für Österreich, Belgien, Finnland, Frankreich, Deutschland, Holland, Italien, Norwegen und Schweden.

Hinweis: Dieser Schukostecker paßt nicht in die italienischen Standardsteckdosen nach CEI 23-16 Norm. Dieses Netzkabel sollte nicht in Dänemark verwendet werden, da hier keine Erdeverbindung hergestellt wird.

Español

El cable de alimentación tipo Europeo Continental dispone de una clavija C4 normalizada IEC83 (CEE 7/7) que permite su utilización tanto en bases de enchufe con toma de tierra macho (tipo C 3b) o con toma de tierra mediante contactos laterales (tipo C 2b) que, en este último caso, suele denominarse "Schuko". Al igual que cualquier otra clavija tipo Schuko, las conexiones a red no están polarizadas cuando se conectan a una base tipo Schuko. El cable lleva autorización para su uso en Austria, Bélgica, Finlandia, Francia, Alemania, Holanda, Italia, Noruega y Suecia. Observe que este cable no se adapta a la norma italiana CEI 23-16. El cable no debe utilizarse en Dinamarca en el caso de no efectuarse conexión a tierra.

Italiano

I cavi d'alimentazione per l'Europa continentale vengono forniti terminati con una spina ad angolo retto del tipo C4 secondo lo standard IEC83 (CEE 7/7) che può essere usato in prese in cui la terra può essere fornita o tramite connettore maschio (C 3b) o tramite clips laterali (C 2b), quest'ultima comunemente detta di tipo tedesca "Schuko". Questa spina, quando collegata ad una presa Schuko, non è polarizzata.

Il cavo può essere usato in Austria, Belgio, Finlandia, Francia, Germania, Olanda, Norvegia, Svezia ed Italia. E' da notare che per l'Italia questo non risponde allo standard CEI 23-16.

Questa spina non dovrebbe invece essere usata in Danimarca in quanto non realizza il collegamento di terra.

Power requirements

The instrument requires an AC supply in the range 90 V to 265 V, at a frequency of 45 Hz to 65 Hz, or 90 V to 110 V at 400 Hz. Power consumption is 150 W. The power supply is autosensing and there is no voltage selector switch.

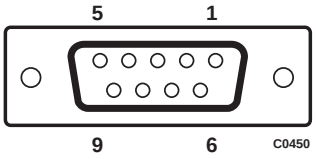
Before switching on ensure that the correct fuses are fitted; these are 2 A time-lag. The fuses are located above the rear-panel AC supply connector.

Goods-in checks

The Goods-In Check verifies that the instrument is functioning correctly, but does not verify conformance to the listed specification. To verify that the instrument conforms to the specification given in Chapter 1, refer to Chapter 6, 'Acceptance testing'.

RS232 connections

Connection to the instrument's RS-232 serial interface is via the 9-way D-type connector on the rear panel.



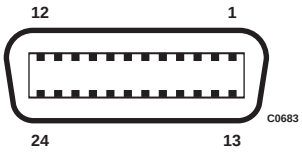
Pin		Pin	
1	Data carrier detect — DCD	6	Data set ready — DSR
2	Receive data — RX	7	Request to send — RTS
3	Transmit data — TX	8	Clear to send — CTS
4	Data terminal ready — DTR	9	Ring indicator — RI
5	Signal ground		

Fig. 2-1 RS232 connector contact assignments

To control the instrument remotely via the serial interface using a PC a NULL MODEM cable assembly is required.

GPIB connections

Connection to the instrument's GPIB interface is via the 24-way IEEE-488 Standard connector on the rear panel. A suitable GPIB lead assembly is available as an optional accessory (part number 43129/189).

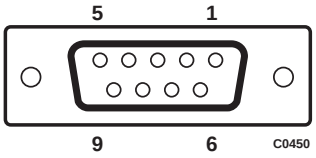


Pin		Pin	
1	Data I/O 1	13	DIO 5
2	Data I/O 2	14	DIO 6
3	Data I/O 3	15	DIO 7
4	Data I/O 4	16	DIO 8
5	EOI	17	REN
6	DAV	18	Forms twisted pair with 6
7	NRFD	19	Forms twisted pair with 7
8	NDAC	20	Forms twisted pair with 8
9	IFC	21	Forms twisted pair with 9
10	SRQ	22	Forms twisted pair with 10
11	ATN	23	Forms twisted pair with 11
12	Ground shield	24	Logic ground

Fig. 2-2 GPIB connector contact assignments

AUX connections

External connections are made via the 9-way D-type connector on the rear panel.



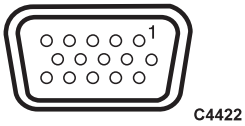
Pin		Pin	
1	Voltage output	6	Data set ready — DSR
2	Receive data — RX	7	Analog output
3	Transmit data — TX	8	Clear to send — CTS
4	Data terminal ready — DTR	9	Signal ground
5	Signal ground		

Note 'Voltage output' is either a 0–10 V ramp voltage proportional to swept frequency or power or a fixed, settable DC voltage.

Fig. 2-3 AUX connector contact assignments

MONITOR connections

This is a 15-way D-type connector providing a standard VGA 640 x 480 color output for an external monitor.

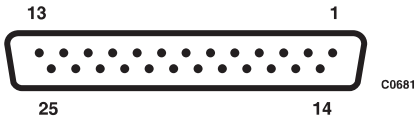


Pin		Pin	
1	RED	9	Ground
2	GREEN	10	Ground
3	BLUE	11	no connection
4	no connection	12	no connection
5	Ground (red)	13	H SYNC
6	Ground (green)	14	V SYNC
7	Ground (blue)	15	no connection
8	Ground		

Fig. 2-4 MONITOR connector contact assignments

PARALLEL PORT connections

This is a 25-way D-type connector for connecting a printer.



Pin		Pin	
1	STB	14	AFD
2	D0	15	ERR
3	D1	16	INIT
4	D2	17	SLIN
5	D3	18	Ground
6	D4	19	Ground
7	D5	20	Ground
8	D6	21	Ground
9	D7	22	Ground
10	ACK	23	Ground
11	BUSY	24	Ground
12	PE	25	Ground
13	SLCT		

Fig. 2-5 PARALLEL PORT connector contact assignments

Rack-mounting the instrument

The 6810A Series may be mounted in a standard 19 inch rack using the rack mounting kit 46885/038, available as an optional accessory.

Battery replacement

The 6810A Series contains non-volatile memory that is powered by a lithium battery when the power is removed. Although battery life can extend to five years, this will depend on conditions of use, e.g. battery life is reduced as the temperature is increased. To avoid loss of data it is recommended that the battery be replaced every two years. Replace the battery as follows:

(1) Ensure that the instrument is switched on; this will provide power for the non-volatile memory while the battery is replaced.

(2) Using a coin or suitable tool, unscrew the battery compartment cover at the rear of the instrument.

(3) Remove the battery and insert the replacement, then replace the battery compartment cover.

The replacement battery should be a SAFT LS6 or equivalent. This is a Lithium 3.5 V type, rated at 1.8 AH, size AA. A suitable replacement battery can be obtained from Aeroflex, part number 23711/106.

Routine maintenance

Cleaning

Before commencing any cleaning, switch off the equipment and disconnect it from the supply. The exterior surface of the case may be cleaned using a soft cloth moistened in water. Do not use aerosol or liquid solvent cleaners.

LCD

To prevent damage to the LCD window, care should be taken not to scratch the surface during use and also when cleaning. The LCD window should be cleaned by wiping a slightly damp, soft, lint-free cloth gently over the surface. To remove grease or smears, use a clean cotton cloth moistened with Heptane. No other cleaning agents should be used. Clean the window using either horizontal or vertical strokes, NEVER a circular action.

Microwave connectors

Care should be taken when using microwave connectors, both on the instrument and any accessories that are used, such as cables, adapters, attenuators, etc. Complying with the following precautionary notes will ensure longer component lifetime and less equipment downtime due to connector or component failure. These measures will also help to ensure that the components will operate within specification and give repeatable results.

- The precision connectors fitted to the instrument and its accessories may be damaged by mating with a non-precision type. Damage to these and other connectors may occur if the connector interface parameters are not within specification. This should be checked with the appropriate gauging tool. It is strongly recommended that every connector be gauged prior to its first use and regularly thereafter, e.g. every 20 connections.
- The precise geometry of the connectors can be easily degraded by dirt and other contamination adhering to connector interfaces. Alcohol is the recommended cleaning agent, and a clean, damp cotton swab is the recommended applicator. When not in use, keep the connectors covered with the protective caps provided.
- Always use the correct mating techniques. In particular, the two connectors to be mated should be pressed together such that the pin penetrates the collet prior to the nut being tightened. Never rotate one connector body relative to the other because this wears out the mating interfaces, thus reducing connector lifetime.
- Avoid over-torqueing connectors during mating, because it may damage the connector center pin or may cause the connector body to turn in its housing.
- Avoid mechanical shock by dropping or otherwise roughly handling microwave components.

CAUTION

Routine safety testing and inspection

In the UK the 'Electricity at Work Regulations' (1989) section 4(2) places a requirement on the users of equipment to maintain it in a safe condition. The explanatory notes call for regular inspections and tests together with a need to keep records.

The following electrical tests and inspection information is provided for guidance purposes and involves the use of voltages and currents that can cause injury. It is important that these tests are only performed by competent personnel.

Prior to carrying out any inspection and tests the equipment must be disconnected from the mains supply and all external signal connections removed. All tests should include the equipment's own supply lead, all covers must be fitted and the supply switch must be in the 'ON' position.

The recommended inspection and tests fall into three categories and should be carried out in the following sequence:

1. Visual inspection
2. Earth bonding test
3. Insulation resistance test.

1. Visual inspection

A visual inspection should be carried out on a periodic basis. This interval is dependant on the operating environment, maintenance and use, and should be assessed in accordance with guidelines issued by the Health and Safety Executive (HSE). As a guide, this equipment, when used indoors in a relatively clean environment, would be classified as 'low risk' equipment and hence should be subject to safety inspections on an annual basis. If the use of the equipment is contrary to the conditions specified, you should review the safety re-test interval.

As a guide, the visual inspection should include the following where appropriate:

Check that the equipment has been installed in accordance with the instructions provided (e.g. that ventilation is adequate, supply isolators are accessible, supply wiring is adequate and properly routed).

- The condition of the mains supply lead and supply connector(s).
- The correct rating and type of supply fuses.
- Security and condition of covers and handles.
- Check the presence and condition of all warning labels and markings and supplied safety information.
- Check the wiring in re-wireable plugs and appliance connectors.
- Check the cleanliness and condition of any ventilation fan filters.
- Check that the mains supply switch isolates the equipment from the supply.
- Check the supply indicator functions (if fitted).

If any defect is noted this should be rectified before proceeding with the following electrical tests.

2. Earth bonding tests

Earth bonding tests should be carried out using a 25 A (12 V maximum open circuit voltage) DC source. Tests should be limited to a maximum duration of 5 seconds and have a pass limit of 0.1 Ω after allowing for the resistance of the supply lead. Exceeding the test duration can cause damage to the equipment. The tests should be carried out between the supply earth and exposed case metalwork; no attempt should be made to perform the tests on functional earths (e.g. signal carrying connector shells or screen connections) as this will result in damage to the equipment.

3. Insulation tests

A 500 V DC test should be applied between the protective earth connection and combined live and neutral supply connections with the equipment supply switch in the 'on' position. It is advisable to make the live/neutral link on the appliance tester or its connector to avoid the possibility of returning the equipment to the user with the live and neutral poles linked with an ad-hoc strap. The test voltage should be applied for 5 seconds before taking the measurement.

Aeroflex employs reinforced insulation in the construction of its products and hence a minimum pass limit of 7 MΩ should be achieved during this test.

Where a DC power adapter is provided with the equipment the adapter must pass the 7 MΩ test limit.

We do not recommend dielectric flash testing during routine safety tests. Most portable appliance testers use AC for the dielectric strength test, which can cause damage to the supply input filter capacitors.

4. Rectification

It is recommended that the results of the above tests are recorded and checked during each repeat test. Significant differences between the previous readings and measured values should be investigated.

If any failure is detected during the above visual inspection or tests, the equipment should be disabled and the fault should be rectified by an experienced Service Engineer who is familiar with the hazards involved in carrying out such repairs.

Safety critical components should only be replaced with equivalent parts, using techniques and procedures recommended by Aeroflex.

The above information is provided for guidance only. Aeroflex designs and constructs its products in accordance with International Safety Standards such that in normal use they represent no hazard to the operator. Aeroflex reserves the right to amend the above information in the course of continuing its commitment to product safety.

Putting into storage

If the instrument is to be put into storage, ensure that the following conditions are maintained:

Temperature range	–40 to +71°C(–40 to +160°F)
Humidity	Less than 93% at 40°C (104°F)

Chapter 3
LOCAL OPERATION

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Introduction

This chapter explains how to operate 6810A Series instruments using the front-panel controls and soft key menus. The first part of the chapter provides illustrations and descriptions of the front-panel features, the rear-panel features and connectors, and the display. This is followed by descriptions of the main operating features. The remainder of the chapter describes the menus in detail.

Descriptions, soft key selections and illustrations cover all instrument versions and options; those that are not applicable to a particular instrument can be disregarded.

Conventions

The following conventions are used in this chapter:

CAPS	Capitals are used to identify names of controls and panel markings, or system functions where no direct reference to an associated key is intended.
[CAPS]	Capitals in square brackets indicate hard key titles.
[Italics]	Italics in square brackets indicate soft key titles.
[Averaging ●]	A ● after a soft key title indicates that the key has a toggle action, and that the function is enabled.
[Averaging ○]	A ○ after a soft key title indicates that the key has a toggle action, and that the function is disabled.

Front-panel features

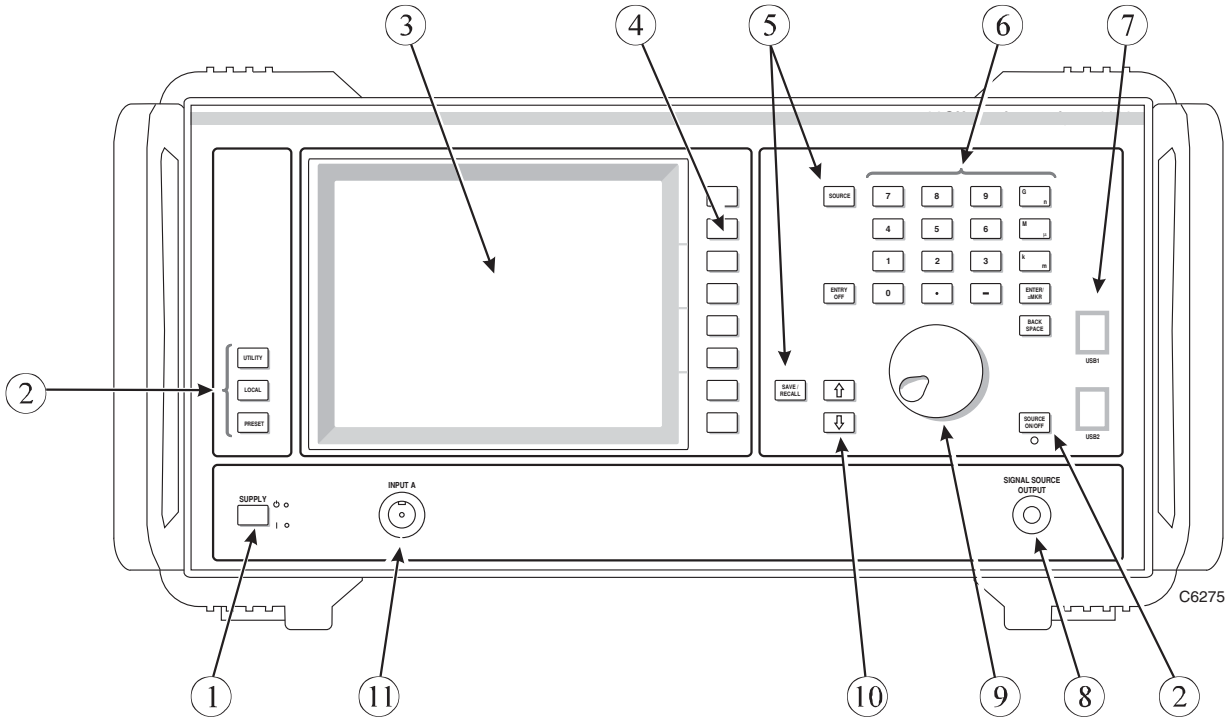


Fig. 3-1 6810A Series front panel

①	**SUPPLY switch**	This key is used to activate the instrument if it is in standby mode; pressing the key again returns it to standby mode (AC power to the instrument is controlled by a rear-panel switch).
②	**System Group keys**	This key group comprises the [UTILITY], [LOCAL], [PRESET] and [SOURCE ON/OFF] keys. They are used for running 6810A Series application programs, presetting the instrument, controlling the RF output and provide various system functions.
③	**Liquid crystal display**	This is used for display of source settings, soft key labels and other information. The display is explained in detail later in this chapter.
④	**Soft keys**	The eight soft keys are used to select the desired control and functional options presented by the various menus accessed through the dedicated function keys on the front panel.
⑤	**Setup Group keys**	This key group comprises the [SOURCE] and [SAVE / RECALL] keys. They are used for controlling the synthesized source and saving/recalling instrument settings.
⑥	**Numeric entry and terminator keys**	These keys are used for entering values of numeric parameters and other numeric entries.
⑦	**USB ports**	For removable storage and/or printer.
⑧	**SIGNAL SOURCE OUTPUT connector**	This is a precision microwave connector for the RF output signal generated by the synthesized source.
⑨	**Rotary control**	Used for adjusting parameter values.
⑩	**Step keys**	The step keys (⇧ and ⇩) are used to step the current value of a parameter up or down.
⑪	**Input connector**	INPUT A accepts a 12-pin connector from a detector cable assembly for providing source power calibration (supplied fitted with a blanking plug).

Rear-panel features

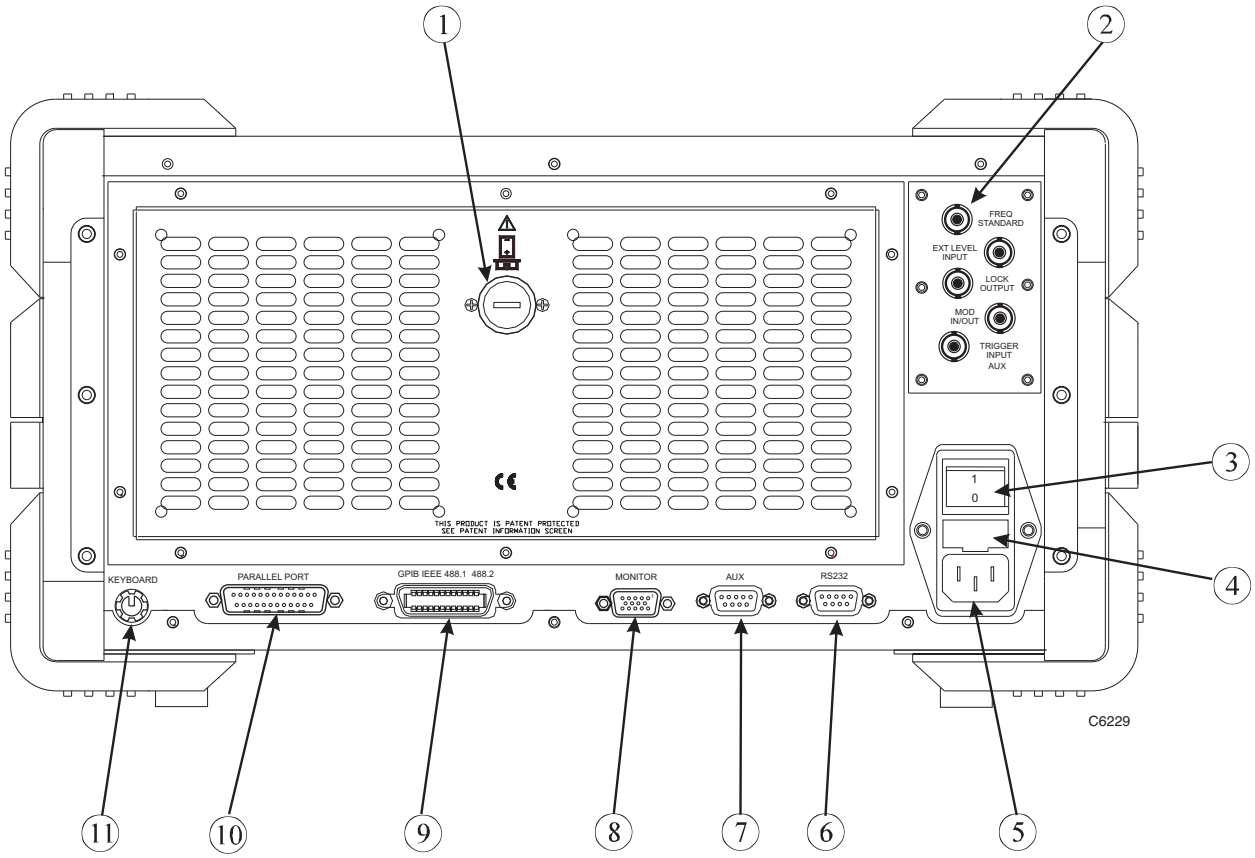


Fig. 3-2 6810A Series rear panel

1	**Battery compartment cover**	Removal of this cover provides access to the Lithium battery that is used to power the instrument's non-volatile memory.
2	**FREQ STANDARD connector**	A BNC connector that provides a 10 MHz output derived from the internal frequency standard, or accepts a 1 or 10 MHz input from an external standard (as selected from the Freq Standard menu, page 3-40).
	EXT LEVEL INPUT connector	A BNC connector that enables the connection of a remote detector or power meter output for source leveling.
	LOCK OUTPUT connector	A BNC connector that provides a ‘source in lock’ TTL output signal when Option 024 (trigger board) is fitted.
	MOD IN/OUT connector	A BNC connector that accepts a suitable signal for modulating the source, or outputs the internally generated modulating signal (if the modulation option is fitted).
	TRIGGER INPUT/AUX connector	A BNC connector that allows an external TTL trigger input signal to be applied when Option 024 (trigger board) is fitted, or an external trigger input or SYNC OUT output when Option 23 (internal modulation) is fitted.
3	**AC power switch**	Controls the AC power to the instrument (the instrument is switched between standby and operating modes using the front-panel SUPPLY switch).
4	**Fuse compartment cover**	Provides access to the AC supply fuses (2 A time-lag).

⑤	**AC power connector**	A 3-pin connector that mates with the supplied AC supply cable.
⑥	**RS232 connector**	A 9-way D-type connector that allows connection to a controller/modem for remote operation of the instrument.
⑦	**AUX connector**	A 9-way D-type connector that provides two signals: (1) A voltage output that is either a 0 to 10 V ramp voltage proportional to swept frequency or power or (2) a fixed, settable DC voltage.
⑧	**MONITOR connector**	A 15-way high density D-type connector that allows connection of a standard VGA color monitor.
⑨	**GPIB connector**	A 24-way GPIB connector that connects the instrument to an external controller when it is to be controlled through the GPIB.
⑩	**PARALLEL PORT connector**	A 25-way D-type connector that is used to connect a suitable printer via the Centronics interface.
⑪	**KEYBOARD connector**	A standard 6-way mini-DIN connector that allows connection of an IBM-compatible keyboard.

Front-panel keys and soft key menus

The functions of the 6810A Series are activated from the front panel by the operator using specific function keys (hard keys), eight soft keys for accessing menu options, a numeric entry key group, a rotary control and step up/down keys.

Note

In this manual all front-panel keys are shown in brackets, e.g. [SOURCE]; soft key labels are shown in brackets in lower case italic type, e.g. *[Source Mode]*.

The term **Input** is defined as:

A front-panel connector (INPUT A) to which is connected a scalar detector for source power calibration.

The hard keys can be grouped into related functions, and a brief outline of their functions is given below:

Summary of key functions

SETUP group

[SOURCE] Provides control of the synthesized generator.

Select **source mode** (CW or sweep), and set up **sweep parameters**.

Select the **leveling mode** that is used to control the output power.

Select the **frequency standard** used by the synthesized source.

Provides control of the programmable **voltage output** (AUX connector).

Provides control of **list sweep mode**.

[SAVE / RECALL] Enables instrument settings to be saved or recalled, using either internal stores or removable storage.

SYSTEM group

[UTILITY] Provides access to instrument setup and service functions:

Set user passwords.
Define the step size used by the step up/down keys.
Configure instrument for a particular country.
Set up instrument for remote (GPIB or RS-232) operation.
Set up the LCD and real time clock.
Instrument store management.
Display/keyboard tests.
Examine power-on test results.
Instrument calibrations.

[LOCAL] Used to return the instrument to local (front panel) operation after being put into remote mode.

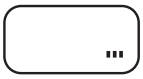
[PRESET] Returns the instrument to its default set-up conditions, or to settings defined by the user.

SOURCE ON / OFF Turns the source on and off.

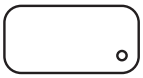
The function currently activated is called the *active function*. As long as a function is active it can be modified with the numeric entry controls (explained later). A function remains active until either another function is selected, [ENTRY OFF] is pressed, or the appropriate soft key that is provided for this purpose is pressed.

Front-panel keys are used to change instrument functions directly or to provide access to additional functions available in soft key menus. These menus are displayed lists of related functions or choices for a particular function, with each choice corresponding to one of the eight soft keys located to the right of the LCD. Pressing one of the soft keys either executes the labeled function and makes it the active function, or changes the current status of a function, or presents another set of menu labels. The type of action is indicated by the shape of the box enclosing the soft key label, as follows:

Indicates that selecting the soft key will immediately cause the instrument to perform the designated function, without any further action from the user.



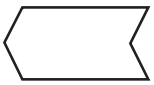
Indicates that, after selecting this soft key, the user will be able to change a parameter. A dialog box will be displayed on the screen containing a title indicating the parameter being changed, and an input field for entering the new value.



Indicates that selecting this soft key will toggle the indicated item on or off. The box contains a representation of an indicator lamp that 'lights up' to indicate that the item is on.

If the top and bottom edges are highlighted, this indicates that out of two or more possible items, this one has been selected. Pressing it will have no effect, but selecting another in the same group will deselect it. The boxes representing soft keys in the same group are linked together by a vertical line.

Indicates that selecting this soft key will present the user with either a new menu or a dialog box. The dialog box is a window displayed on the screen to allow users to change one or more parameters that make up the entries in the form. The soft keys are used to select, change add or delete parameters, and various other operations according to the function involved.



This is always the bottom soft key of a menu, and is the 'return' key that returns the user to the previous level of the menu structure.

Unselectable items are indicated by a dotted outline.

Top-level menus, i.e. the ones displayed when a hard key is pressed, are indicated by surrounding the menu title with a box outline.

Most menus allow access to other top-level menus simply by pressing the appropriate hard key. The user does not need to return to the top-level menu from which the current one is derived. The exceptions to this are menus to do with editing, where the user must return to the top-level menu by pressing the appropriate return soft keys.

Detailed descriptions of all the 6810A Series menus are given later in this chapter.

At the start of each menu description is shown the path for that menu, i.e. the key-presses the operator must make in order to access the menu. The menu title and soft key labels are listed on the left hand side of the page, exactly as they would be shown on the display. The right hand column contains the descriptions.

Numeric entry

The numeric keypad, rotary control and step keys are used in conjunction with other front-panel keys and soft keys to modify the active entry and to enter or change numeric data. In many cases, the keypad, rotary control and step keys can be used interchangeably.

Before a function can be modified it must be made the active function by pressing a front-panel key or soft key. It can then be modified directly with the step keys or rotary control, or the new value can be entered on the numeric keypad and followed by a terminator as described below.

Numeric keypad. Used to enter digits, decimal point and minus sign for numeric entries, followed by a units terminator.

Units terminator keys. These are the four keys to the right of the numeric keypad. They are used to specify the units for numeric entries from the keypad, and at the same time terminate the entries. A numeric entry is incomplete until a terminator is supplied. Some functions, for example where only a single digit entry is required, do not require a terminator. The units are abbreviated on the terminator keys as follows:

G n	Giga / Nano (10^{9} / 10^{-9})
M μ	Mega / Micro (10^{6} / 10^{-6})
k m	kilo / milli (10^{3} / 10^{-3})
ENTER / =MKR	basic units such as Hz, Volts etc.; unitless entries, such as Averaging Number.

Functions can be terminated with any of the above terminator keys. The first three keys represent both positive and negative powers of ten, but the power represented by a particular terminator key at any given time is context dependent. That is, the parameter being changed determines whether positive or negative powers of ten apply (e.g. positive powers apply for frequency, and negative powers for voltage).

Some parameters which have a particularly wide range will default to either positive or negative powers of ten, but may be changed by pressing [–] before pressing a terminator key. For example, power in Watts defaults to negative powers of ten (n, μ, m), but positive powers (G, M, k) can be achieved by first pressing [–] before terminating the numeric entry.

Within the menu descriptions, each function requiring numeric entry will indicate the valid terminator by use of the following conventions:

10^{+}	indicates positive powers of ten, including the [ENTER / =MKR] key.
10^{-}	indicates negative powers of ten, including the [ENTER / =MKR] key.
Any	indicates that any terminator key can be used.

A checklist box is used to indicate which terminators apply for numeric entry, and also whether the step keys or rotary control can be used. An example is shown below:

Rotary Control ✗	Step Keys ✗	Numeric Pad √	Terminator	**10^{+}**

Rotary control. This is used to make continuous adjustments to current values for various functions. The sensitivity and rate of parameter update depends on the parameter being controlled. Values changed by the rotary control are effective immediately, and require no units terminator. The control can also be used to move horizontally between input fields on the displayed forms of certain menus.

Step keys (⇧ and ⇩). These are used to step the current value of the active function up or down. The step size can be independently set for various parameter types, such as frequency, power and voltage, by accessing the Inc/Dec Steps menu, accessed via the [UTILITY] key. The keys autorepeat when held down. The step keys can also be used to move vertically between input fields on the displayed forms of certain menus.

[ENTRY OFF]. When a numeric entry has been terminated with one of the units keys, the display is updated to reflect the new value. However, the numeric entry form remains to allow the parameter to be further modified, if required. Pressing [ENTRY OFF] removes the form, as well as any displayed prompts, error messages or warnings.

[BACK SPACE]. Deletes the last digit entered from the numeric keypad.

Using numeric keys for store and file selection

When a store (or file) has to be selected a list of the appropriate stores will be presented with an index number beside each entry. In addition to using the step keys (⇧ and ⇩) to select the store, the index number may be entered using the numeric keypad and terminated with the [ENTER / =MKR] key.

Text entry

Many of the instrument's functions require the entry of text, for example when entering store and file names, and descriptive text for stores. When text entry is required, a form is displayed containing an input field and four rows of characters arranged as follows:

New Store Name
Output 1_____
a b c d e f g h I j k l m n o p q r s t u v w x y z
à á â ã ä å æ ç è é ê ë ì í î ï ð ñ ò ó ô õ ö ø ù ú û ü ý ÿ þ
0 1 2 3 4 5 6 7 8 9 ! ” # $ % & ’ ( ) * + , - . /
: ; < = > ? [\ ] ^ _ { | } ~ £ µ

The character that is to be selected is enclosed by a box that can be moved along the rows of characters using the rotary control. The step keys are used to select the required row. The front-panel keys 0 to 9, '.' and '–' can be used directly.

For entry of store/file names, the following soft keys are displayed:

[Select Character]	Adds the selected character to the input field at the cursor position.
[Space]	Adds a space character to the text input at the cursor position.
[Caps Lock]	Toggles caps lock on and off.
[Cursor Left]	Moves the cursor left one character.
[Cursor Right]	Moves the cursor right one character.
[Delete Character]	Deletes the character at the cursor position.
[Erase Text]	Removes all the text from the input field.
[Done]	Terminates text entry.

Some functions allow longer text strings to be entered or edited, such as descriptive text for stores. In these cases, *[Cursor Left]* and *[Cursor Right]* appear on a sub-menu together with additional soft keys for moving the cursor quickly through the input field: *[Word Left]*, *[Word Right]*, *[Start of Text]* and *[End of Text]*.

Text entry can also be achieved using an external IBM PC keyboard connected to the rear-panel KEYBOARD connector of the instrument. An external keyboard can also be used instead of the front panel to control all the instrument functions (see 'Using an external keyboard', page 3-15)

Display

Display features

Fig. 3-3 illustrates the information that is displayed on the screen.

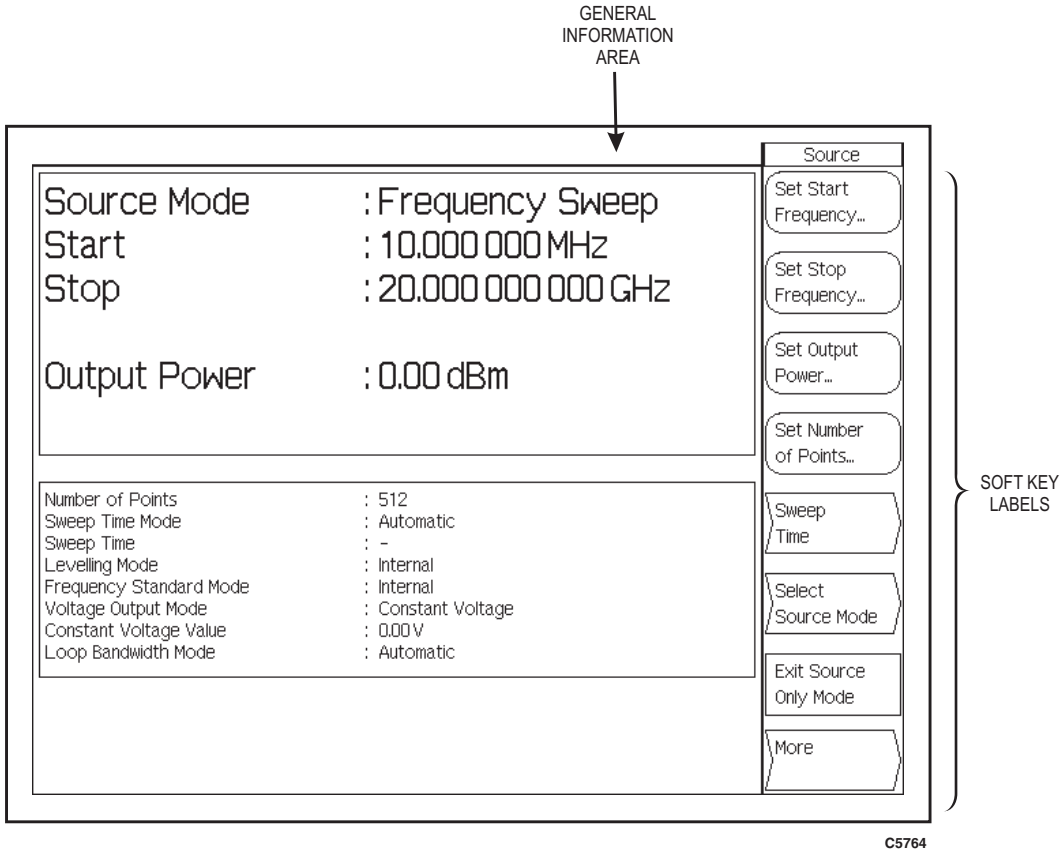


Fig. 3-3 6810A Series display features

Soft Key Labels are menu labels displayed on the screen that re-define the functions of the soft keys immediately to the right of the screen. The title of the menu is displayed at the top of the menu area to indicate where the user is within the menu structure. See 'Front-panel keys and soft key menus' for a description of menu operation.

Source Menu

Source Start Value is the start value of the sweep in appropriate units: e.g. start frequency for a frequency sweep or start power for a power sweep.

Source Stop Value is the stop value of the sweep.

General information area

This area is located at the top of the screen, and provides the user with general information about the instrument. It is displayed in the format shown in Fig. 3-4.

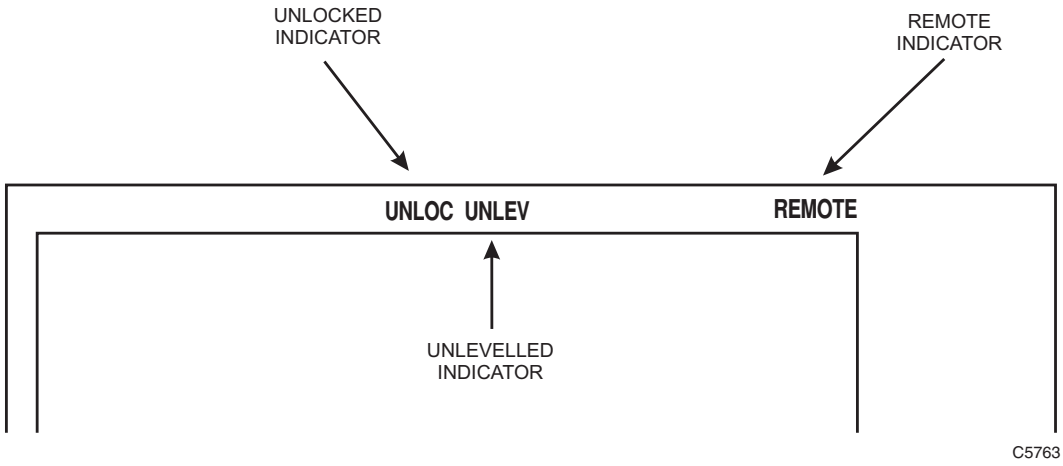


Fig. 3-4 General information area

Unlocked Indicator (UNLOC) and External Standard State Indicator (XSTD?). **UNLOC** indicates that the source has failed to lock to the required frequency. **XSTD?** is displayed in this position if the instrument is set up to use an external standard, but there is either no standard detected or it is the wrong frequency.

Unleveled Indicator (UNLEV) indicates that the source power is unleveled.

Remote Indicator (REMOTE) indicates that the instrument is in the remote state (RS-232 or GPIB). **REMLOC** is displayed if this is also local lockout mode, i.e. the front-panel controls are locked out.

Error messages

During operation of the instrument, one of several types of error message may be displayed on the screen. The message gives a description of the problem that has occurred and, where appropriate, the action that the operator can take to solve the problem. Appendix B lists all the possible error messages that the operator can receive.

Data storage

Various types of data can be stored, either internally within the instrument or on removable storage, including:

Instrument settings
Source power calibrations

When the above data is stored internally, it is saved as an MS-DOS file on the instrument's flash card (which mimics the operation of a hard disk). Data can also be saved to removable storage through the USB ports on the front panel. Other applications for removable storage are:

A new set of country-specific instrument settings (e.g. language, keyboard layout, date/time format) can be installed from removable storage.

Functions that allow access to the removable storage have a ***[USB Memory]*** soft key in the associated menu. When this is pressed, directories and files within the current directory are listed.

Files (and also directories on removable storage) are selected by highlighting them using the ***[⇧]*** and ***[⇩]*** soft keys. The ***[Set Store Information]*** soft key allows some descriptive text to be saved with the store and a password to be specified for accessing the store. When a store is highlighted the text and password status (enabled or disabled) is displayed below the directory/file list. Described below is a typical case of saving a setting to removable storage.

Copying data between an internal store and removable storage

Instrument settings and other data can be copied between removable storage and the instrument's internal stores. For example:

[UTILITY]
[Store Mngmnt]
[Settings]

This activates a sub-menu which enables instrument settings memory stores to be selected using the ***[⇧]*** and ***[⇩]*** soft keys. The ***[USB Memory]*** soft key is used to switch between internal and removable storage stores. A directory is entered by highlighting it then pressing ***[Change Directory]***. When a store is highlighted this soft key becomes ***[Delete]***, which is used to remove the store.

To copy a store, it is selected as described above; if the store is on removable storage the destination will be internal store and vice versa. Pressing the ***[Copy]*** soft key performs the copy operation.

Other types of store can be copied/deleted in the same way.

The 6810A Series Synthesized Generator

The following source settings will be displayed:

Source mode (CW, Frequency Sweep, etc.)
Start & Stop values
Number of points (if applicable)
Sweep time (if applicable)
Output power (CW & swept frequency modes)
Output frequency (power sweep mode)
Leveling mode
Frequency standard mode
Voltage output mode
Constant voltage value (if applicable)
Loop bandwidth mode
List sweep mode

Using an external keyboard

As an alternative to using the front panel to control the instrument's functions, it can be operated from an external IBM PC keyboard connected to the rear-panel KEYBOARD connector. The keys are mapped to the instrument's keys as follows:

6810A Series key	Keyboard	6810A Series key	Keyboard
Soft keys 1 to 8	F1 to F8	[PRESET]	<Alt> PR
		[SOURCE ON/OFF]	<Alt> RF
		[G n]	<Ctrl> G
		[M μ]	<Ctrl> M
		[k m]	<Ctrl> K
		[ENTER / =MKR]	<ENTER>
		[BACK SPACE]	<BACKSPACE>
		[ENTRY OFF]	<ESC>
		Increment (↑)	Up arrow key
		Decrement (↓)	Down arrow key
[SOURCE]	<Alt> SO	[0] to [9]	0 to 9
		[–]	–
		[.]	.
[SAVE / RECALL]	<Alt> SR	Rotary control	Left / right arrow keys
[UTILITY]	<Alt> UT		

International settings

The 6810A Series allows various instrument settings to be specified according to the country in which the instrument is to be used. These country specific settings are:

Language	*External keyboard layout*
Date format	*Time format*
Decimal point	*Spreadsheet separator*

The settings can be changed using the International menu, accessed via the [UTILITY] key:

[UTILITY]
[International]

Displays the current settings and provides a menu for changing them. The ***[⇧]*** and ***[⇩]*** soft keys are used to select a parameter for changing. A list of the available values for the parameter appears below the parameters section. The ***[Change]*** soft key moves the highlight into the selection list so that a new value for the parameter can be selected, by pressing ***[Select]***. The ***[Go to Param Selection]*** soft key moves the highlight back into the parameters section..

Note that the above parameters can be quickly set to default combinations by setting the **Country** parameter to the desired country.

Settings for additional countries may be available on removable storage, and can be installed by pressing

[UTILITY]
[International]
[Install New Locale]

The ***[⇧]*** and ***[⇩]*** soft keys are used to select the required country, if there are more than one. Pressing ***[Add]*** installs the settings into the instrument.

User-defined passwords

Two levels of user-defined password are provided:

The User Level 1 password is a 4-digit code in the range 1000 to 9999, and protects those calibration functions that cannot affect the instrument's factory calibration. The factory-et default password is 9999.

The User Level 2 password is a 6-digit code in the range 100000 to 999999. The factory-et default password is 999999.

Unauthorized use protection

A function is provided to lock the user interface against unauthorized use. When enabled, normal source information is not displayed, and the unlocking password is requested. This password consists of 9 digits, and is set and verified by the user each time the function is used. The function is not disabled by a power-off / power-on cycle.

Store overwrite protection

When a store is saved via the user interface, the operator has the option of protecting it against overwriting by means of a unique 6-digit password. If the user decides to protect, the instrument prompts for the password, and verification, before storing. When overwriting a protected store, the instrument accepts either the unique password, or the primary password. A primary password protected function is provided, to erase all settings stores.

Entering a new password

Some instrument functions need to be enabled by entering a Level 1 or Level 2 password. A new password can be specified using the following sequence:

[UTILITY] ***[Security] [Set Passwords]***

A primary 6-digit password must be entered in order to continue any further. Each instrument leaves the factory with the primary password held in the screen title associated with the instrument settings store called 'password'. This can be viewed using

[SAVE/RECALL]*[Recall Settings]*

and selecting the appropriate settings store.

(If this store is overwritten at any time before the primary password has been noted, contact the nearest Service Center).

A sub-menu will then appear enabling the level 1 and level 2 passwords to be set by pressing the ***[Set Level 1 Password]*** and ***[Set Level 2 Password]*** soft keys respectively and then entering a new password.

The level 1 password is a 4-digit number in the range 1000 to 9999, and the factory-se default is 9999. The level 2 password is a 6-digit number in the range 100000 to 999999, and the factory-set default is 999999.

Installing a printer

Initial setup

1 Connect a PC-compatible USB keyboard and mouse to the USB ports on the front panel. If you have a USB hub, use it to allow the mouse to share the same port as the keyboard.

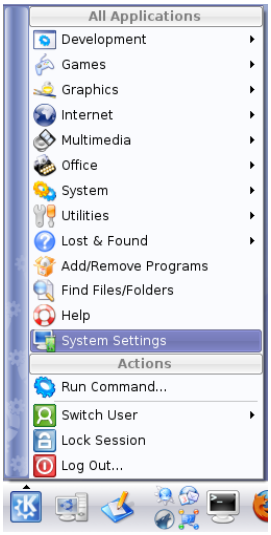
__Note__: setup is quicker with a mouse, but if you do not have one, you can use the keyboard on its own. Press __ALT+F12__ to enable the [__Up Arrow__] / [__Down Arrow__] [__Left Arrow__] / [__Right Arrow__] keys to move the mouse cursor. Press __ALT+N__ for Next>, __ALT+D__ for Model, etc.

2 If a USB printer is to be added, do not connect it to the 6810A yet unless you have a port free because you are using a USB hub (see step 1). If a parallel printer is to be added, connect it to the parallel port on the rear panel and ensure that it is switched on.

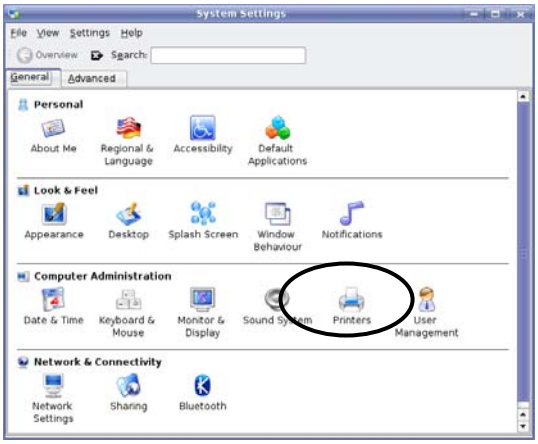
3 Power up the 6810A and wait until the measurement screen is displayed.

4 Press **ALT+F4**. This terminates the 6800 measurement display application. You should now see a clear desktop.

5 Click on the 'K' icon at the bottom left of the screen. From the pop-up menu, click on *System Settings*.



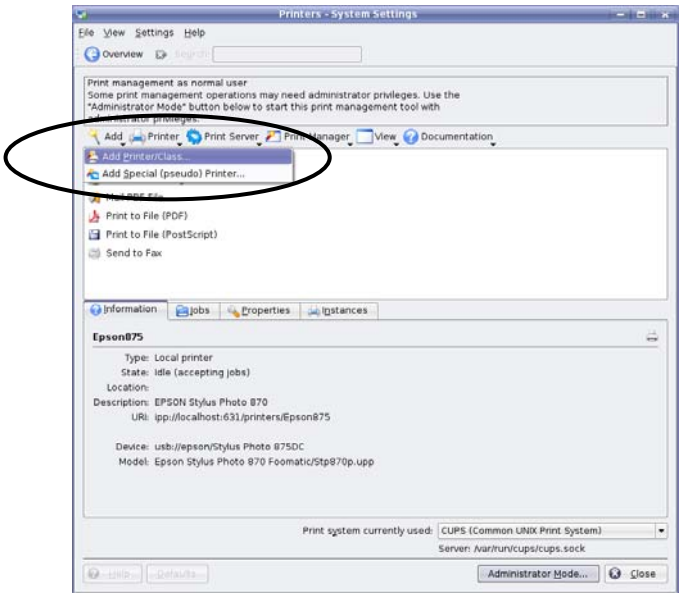
6 Under *Computer Administration* click on *Printers*.



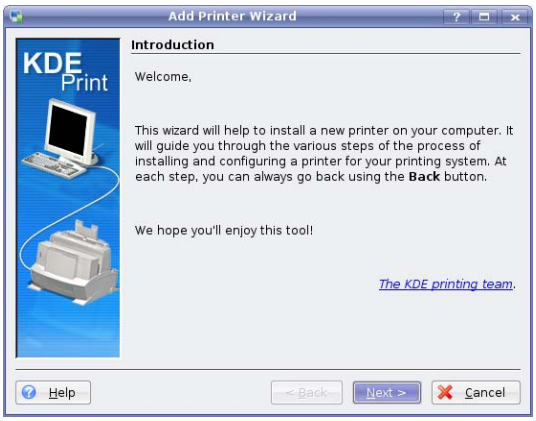
7 The *Printers – System Settings* window appears.

8 At this stage, if you are installing a USB printer, you need to connect it to a USB port on the 6810A. If you have a USB hub, use any free port; if not, disconnect the keyboard and replace it with the printer. Switch the printer on.

9 Select Add\Add Printer/Class… to run the *Add Printer* Wizard.

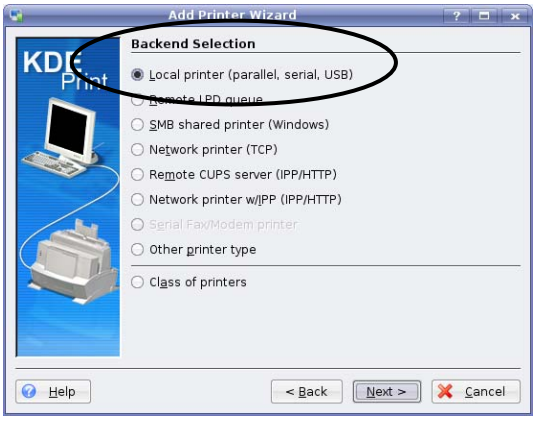


Introduction



Click **Next>** to move to the next screen.

Backend selection



1 Select Local printer (parallel, serial, USB).

2 Click **Next>** to move to the next screen.

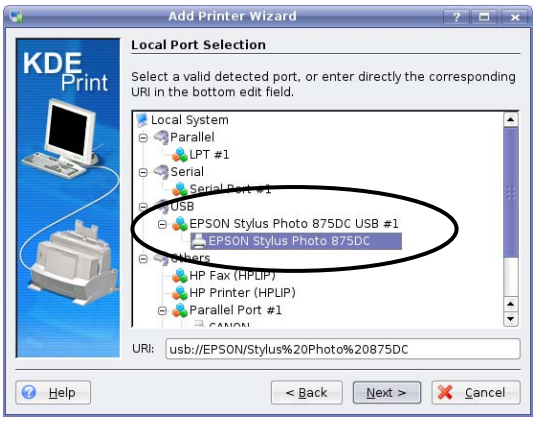
Local port selection

USB printer

1 The printer should have been recognised by the system and appears under *USB* on the displayed tree diagram.

2 Select the required printer.

3 Click **Next>** to confirm the port and move to the next screen.



***Note**: the printer may appear a second time on the list under a separate branch of the tree labelled 'Others'. DO NOT select this version.*

Parallel printer

1 The printer name does not appear on the list. Simply select 'LPT #1'.

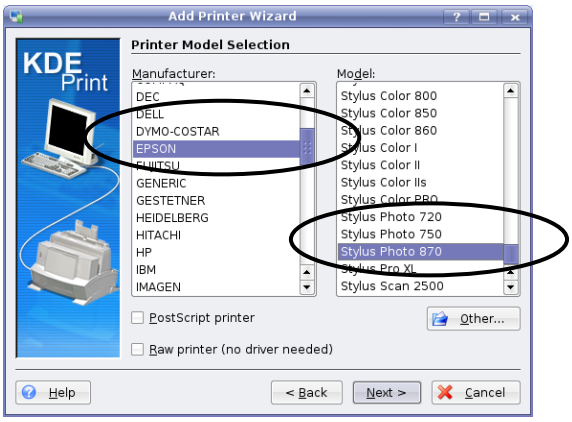
2 Click **Next>** to confirm the port and move to the next screen.

Printer model selection

Note that this screen may take many seconds to load.

1 Select the manufacturer of the printer

2 Select the corresponding printer model from the list in the right-hand panel. If the precise model is not shown, the driver for a model from the same printer family may work satisfactorily. Some experimentation may be required.



3 Click **Next>** to confirm the printer and move to the next screen.

Driver selection

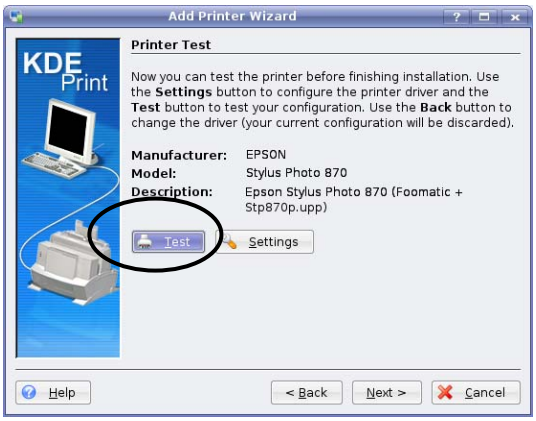
Note that this page appears only if there is more than one driver available for the model of printer selected.

If this page does appear, it is generally advisable to accept the recommended default driver, which is highlighted automatically.

Click **Next>** to confirm the driver and move to the next screen.

Printer test

1 Click the **Test** button, which sends a test page to the printer. This gives a high level of confidence that the printer will work successfully with the instrument. Wait for the test page to be printed. If it is not satisfactory, click **<Back** to go back to the previous page and select a different driver. Repeat this until the test print result is satisfactory.

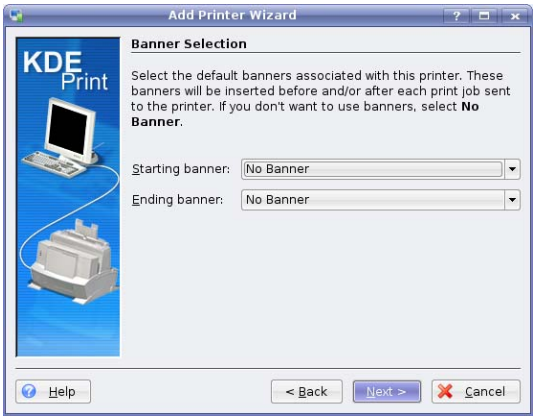


2 Click **OK** to dismiss the pop-up message.

3 Click **Next>** to move to the next screen.

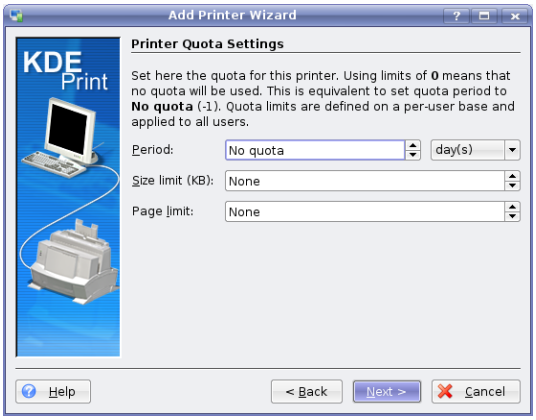
Banner selection

Leave the default settings and click **Next>**to move to the next screen.



Printer quota settings

Leave the default settings and click **Next>**to move to the next screen.



Users access settings

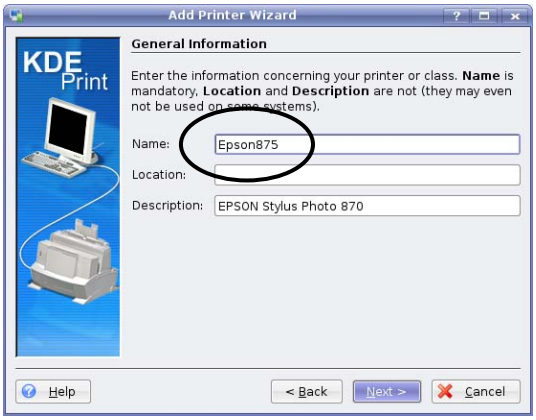
Leave the default settings and click **Next>** to move to the next screen.

General information

1 At this stage, you need to reconnect the keyboard if you disconnected it earlier. If the printer is USB, and you do not have a USB hub, disconnect the printer and connect the keyboard in its place.

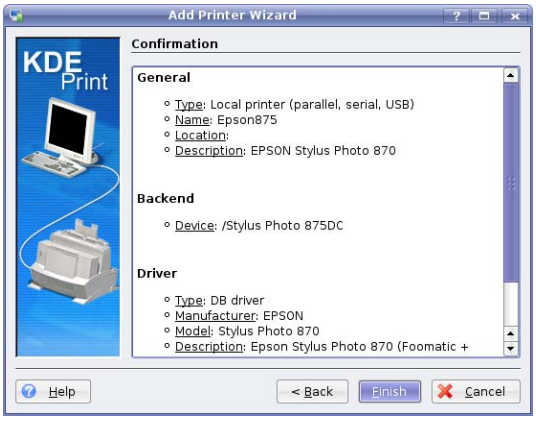
2 Type a name for the printer (e.g. HPLaserJet). This is the name by which it is identified when selected from the instrument's front panel. Note that space characters are not allowed.

3 Click **Next>** to confirm the name and move to the next screen.

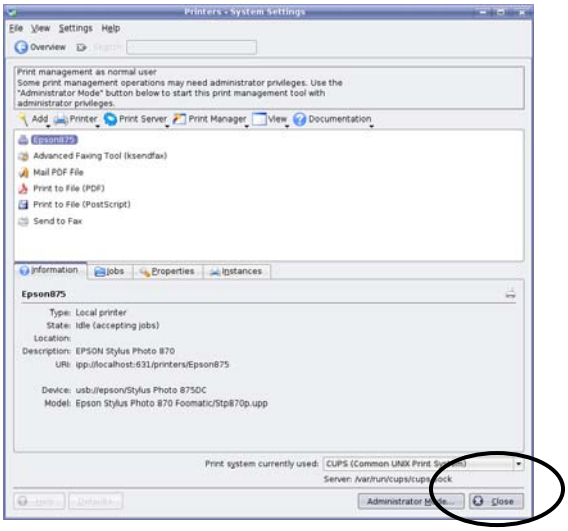


Confirmation

1 Click **Finish** to finish the wizard.



3 Click **Close** to exit from the System Settings application.



3 Power the 6810A off and then on again.

The printer you have just added is listed when you press **[PRINT]** ***[Select Printer]***, and can be selected using the ***[⇧]*** , ***[⇩]*** and ***[Select]*** soft keys.

Substituting a printer with another of the same model

Some USB printers identify themselves by model via the plug-and-play system, and some by a combination of model and serial number. Printers that identify themselves by model only can be readily substituted with another of the same model, and the new printer will be recognised by the 6810A.

However, those identified by model *and* serial number cannot be substituted by another of the same model since the serial number part of the new identifier does not match that stored in the 6810A. In this case, the substitute printer must be installed as a new device, using the above procedure.

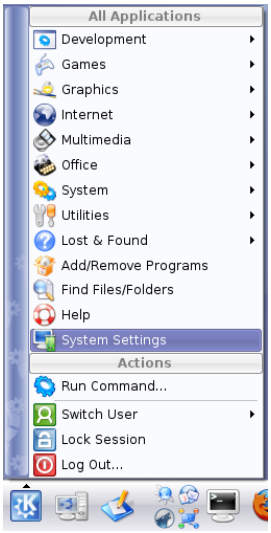
Removing a printer

1 Connect a PC-compatible USB mouse to a USB port on the front panel.

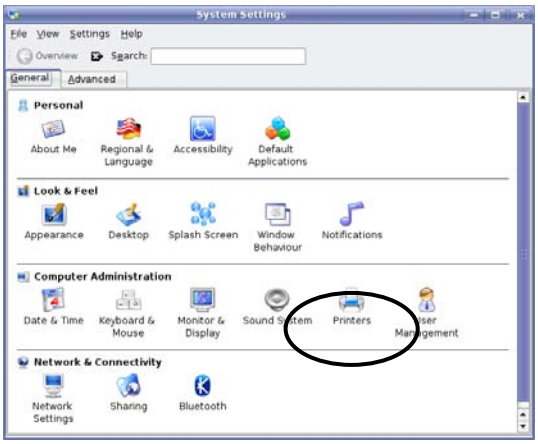
2 Power up the 6810A and wait until the measurement screen is displayed.

3 Press **ALT+F4**. This terminates the 6800 measurement display application. You should now see a clear desktop.

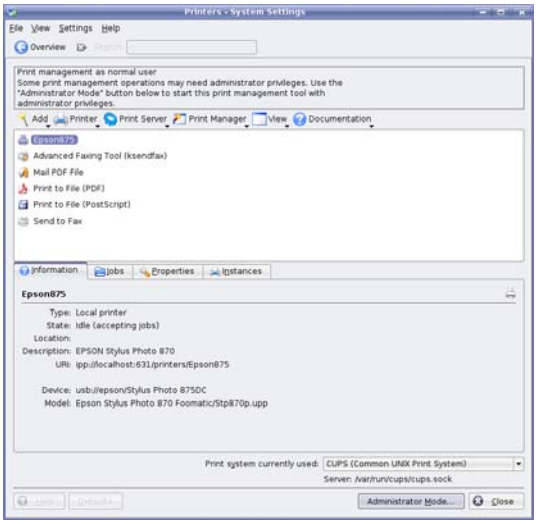
4 Click on the 'K' icon at the bottom left of the screen. From the pop-up menu, click on *System Settings*.



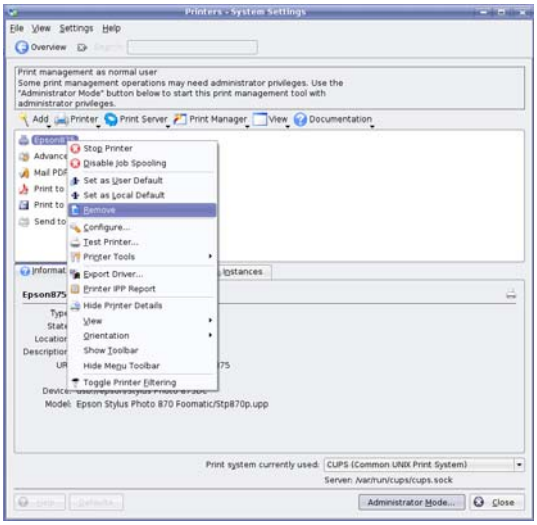
5 Under *Computer Administration* click on *Printers*.



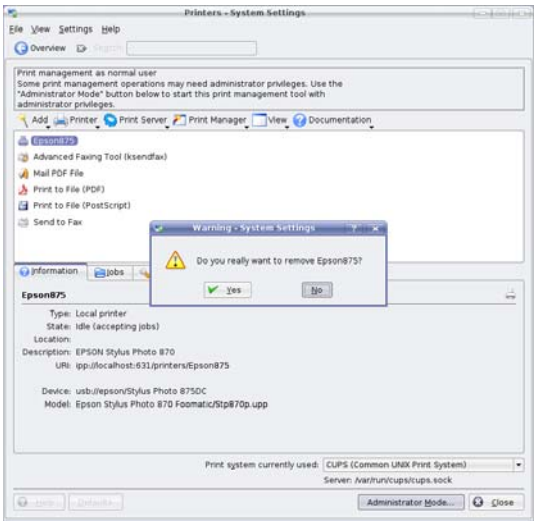
6 The *Printers – System Settings* window appears. It shows the currently installed printer(s).



7 Right-click the printer you want to remove. Select Remove from the drop-down menu.



8 When asked, confirm that you want to remove the printer. The printer is removed.



9 Click **Close** to exit from the System Settings application.

10 Power the 6810A off and then on again to return to normal operation.

Setting up the LCD

Facilities are provided to set the backlight brightness and color palette for the LCD. The backlight brightness can be selected from four settings (plus Off). For instruments with a monochrome LCD, the color palette function is replaced by one that allows the contrast to be set. These functions are available from the Display menu, accessed via the [UTILITY] key:

[UTILITY]
[Service]
[Set-up]
[Display]

The ***[Minimum Brightness***], ***[Low Brightness], [High Brightness]*** and ***[Maximum Brightness]*** soft keys are used to set the brightness level of the backlight. For a monochrome display it can also be turned off.

Pressing the ***[Colour Palettes]*** soft key (color displays) leads to a sub-menu from which a color palette can be selected

Pressing the ***[Contrast]*** soft key (monochrome displays) allows the contrast to be set between 0 and 100%.

Setting the real-time clock

A real-time clock is provided which can be used to date/time stamp hard copy output or files on removable storage. If necessary, the real-time clock can be set as follows:

[UTILITY]
[Service]
[Set-up]
[Set Date & Time]

Enters the Date & Time menu and the current date and time are displayed.

Pressing ***[Enter Date]*** allows the date to be changed. When a terminator key is pressed to enter a value the next field will be selected. Pressing ***[Enter Time]*** allows the time to be similarly changed. When the ***[Store Date & Time]*** soft key is pressed the new numbers are checked. If the checks pass then the instrument's real-time clock and calendar will be updated with the entered values.

Remote operation

The 6810A Series can be controlled remotely via the GPIB or RS-232 (serial) interfaces. The GPIB interface provides instrument control with full talk and listen capability.

Using the instrument

Precautions

Microwave connectors

Care should be taken when using microwave connectors, both on the instrument and any accessories that are used, such as cables, adapters, attenuators, etc. Complying with the following precautionary notes will ensure longer component lifetime and less equipment downtime due to connector or component failure. These measures will also help to ensure that the components will operate within specification and give repeatable results.

- The precision connectors fitted to the instrument and its accessories may be damaged by mating with a non-precision type. Damage to these and other connectors may occur if the connector interface parameters are not within specification. This should be checked with the appropriate gauging tool. It is strongly recommended that every connector be gauged prior to its first use and regularly thereafter, e.g. every 20 connections.
- The precise geometry of the connectors can be easily degraded by dirt and other contamination adhering to connector interfaces. Alcohol is the recommended cleaning agent, and a clean, damp cotton swab is the recommended applicator. When not in use, keep the connectors covered with the protective caps provided.
- Always use the correct mating techniques. In particular, the two connectors to be mated should be pressed together such that the pin penetrates the collet prior to the nut being tightened. Never rotate one connector body relative to the other because this wears out the mating interfaces, thus reducing connector lifetime.
- Avoid over-torquing connectors during mating, because it may damage the connector span pin or may cause the connector body to turn in its housing.
- Avoid mechanical shock by dropping or otherwise roughly handling microwave components.

Switching on

Connect the instrument to the AC supply using the AC supply lead provided with the instrument.

If the yellow SOFT START LED that is adjacent to the front-panel SUPPLY switch is illuminated, this indicates that AC power is being applied to the instrument; if not, operate the switch above the AC supply connector. Pressing the SUPPLY switch activates the instrument and the green POWER LED will illuminate.

A self-test routine is first of all carried out; if the self-test fails, the test results are logged and a message is displayed. To access the test results, press **[UTILITY]** ***[Service] [Status] [Display Test Results],*** which will indicate the reason for the failure.

Once the self tests have been completed, the instrument will be automatically set up to the state it was in when it was last powered down. However, the [PRESET] key can be used to force the instrument into its default state, or to preset the instrument according to the contents of a user-defined settings store (the ***[Save Settings as User Default]*** soft key in the Save/Recall menu is used to save instrument settings to a user default settings store).

Source control

Source modes

The following source modes are available:

Start / Stop Frequency Sweep	Linear frequency sweep between user-defined start and stop values (this is the default).
Center / Span Frequency Sweep	Linear frequency sweep defined by its center frequency and span.
CW	Continuous wave output at user-defined frequency and power. The CW signal can be frequency modulated (external FM with no

	options fitted; internal and external FM when Option 23 fitted) and pulse modulated (external pulse with Option 25 fitted; internal and external pulse with Options 23 and 25 fitted).
Power Sweep	Linear power sweep between user-defined start and stop values.
List sweep mode	Internally- or externally-triggered forward and reverse sweep over up to 1024 frequency points.

The number of frequency points and the sweep time can be set.

Leveling

Leveling is used to control the power level of the instrument's RF source, via a fast, closed-loop feedback system. The control (feedback) signal used to level the output can be derived from either the internal leveling detector of the 6810A Series, or from an external detector or power meter, connected to the rear-panel EXT LEVEL INPUT

Internal leveling provides a constant signal at the SIGNAL SOURCE OUTPUT connector regardless of reflections by adjusting the level of the source, thus improving the source match. A further improvement in source match can be gained by using the external leveling mode, so that leveling is done at a point in the system closer to the test port. The emergent signal, at the leveled point in the system, is constant, regardless of the signal traveling back towards the source; in this way the source appears matched.

Frequency standard

Under normal circumstances the internal crystal oscillator of the instrument would be used as a frequency reference for the synthesized source. If necessary, however, an external frequency standard of higher accuracy and stability can be connected to the FREQ STANDARD rear-panel connector. Either a 1 MHz or 10 MHz external frequency can be used, as specified in the Freq Standard menu.

Voltage output

The integral voltage source (available at the rear-panel AUX D-type connector) can be used to provide a fixed voltage to bias devices such as PIN attenuators, or to provide a ramp voltage proportional to swept frequency or power.

Frequency modulation of the source

The source can be frequency modulated (in CW mode) using an external modulating signal applied to the rear-panel MOD IN/OUT connector. An internally-generated modulating signal can be used if the Internal FM option is fitted.

Pulse modulation of the source

The source can be pulse modulated (in CW or swept mode) by an external pulse applied to the rear panel MOD IN/OUT connector if the Internal Pulse Modulator option is fitted. Internally-generated pulses can be used if the Internal FM and Pulse Modulator option is fitted. Pulse width and other characteristics can be set for internal modulation. If the Internal FM option only is fitted, pulses are fed to the the rear panel MOD IN/OUT connector to drive an external pulse modulator.

SETUP GROUP KEYS

[SOURCE] key

The [SOURCE] key provides access to the series of menus illustrated in Fig. 3-6, which are used to define and control all the source functions, e.g. the synthesized sweep generator and the programmable voltage output (AUX connector). When the [SOURCE] key is pressed, the Source menu is displayed; this in turn provides access to the other soft key menus.

The *[Select Source Mode]* soft key is used to access the Source Mode menu, and the required source mode is then selected by pressing the appropriate soft key. Pressing *[Return to Source]* will return the user to the Source menu corresponding to the selected mode. There are therefore four Source menus available, one for each of the source modes that can be selected from the Source Mode menu. The source modes available are:

- Start & Stop Frequency Sweep Mode (linear frequency sweep between user-defined start and stop values).
- Center & Span Frequency Sweep Mode (linear frequency sweep defined by its center frequency and span).
- CW Mode (continuous wave output at a user-defined frequency and power).
- Power Sweep Mode (power sweep between user-defined start and stop values).
- List Sweep Mode (output a user-defined frequency list).

The last three soft keys of the Source menu are the same for each source mode; the remaining five will vary to reflect the parameters required for the particular source mode.

Menus that occur more than once within the Source menu structure (e.g. Source Mode menu and Sweep Time menu) are described only once. For subsequent occurrences, a reference is made to the relevant part of the chapter.

The source can be frequency modulated using an external modulating frequency present at the MOD IN/OUT connector on the rear panel. The modulating signal can also be derived internally if the Internal FM option is fitted.

SOURCE

Source (Start/Stop Frequency Sweep Mode)

This menu enables the source to be set up to provide a linear frequency sweep between the start frequency and stop frequency values.

Reverse frequency sweeps are possible by making Start Frequency > Stop Frequency.

Set Start Frequency

Used to change the start frequency of the source to a value within the range permitted for the particular instrument.

Rotary Control	√	Step Keys	√	Numeric Pad	√	Terminator	**10+**

Set Stop Frequency

Similar to the above but applies to the stop frequency of the sweep.

Set Output Power

Used to change the output power of the source.

Rotary Control	√	Step Keys	√	Numeric Pad	√	Terminator	**Any**

Set Number of Points

Used to change the number of points generated by the sweep , up to a maximum of 1601 points.

Rotary Control	√	Step Keys	√	Numeric Pad	√	Terminator	**Any**

Sweep Time

Leads to the Sweep Time menu, which enables the sweep time to be set up manually or automatically.
See page 3-37.

Select Source Mode

Leads to the Source Mode menu, which enables CW operation or one of several sweep modes to be selected.
See page 3-38.

More

Leads to the second page of the Source menu.
See page 3-31.

SOURCE | More

Source — **This is a continuation of the previous menu.**

Levelling — Leads to the Levelling menu, which allows the leveling mode that is used to control the output power to be selected.
See page 3-39.

Frequency Standard — Leads to the Freq Standard menu, which allows the frequency standard to be used by the synthesized source to be selected.
See page 3-40.

Voltage Output — Leads to the Voltage O/P menu, which enables the voltage output facility to be set up.
See page 3-41.

Loop Bandwidth — Leads to the Loop Bandwidth menu, which enables the synthesizer loop bandwidth to be varied.
See page 3-42.

Pulse Mod — Leads to the Pulse Modulation menu, which enables internal or external pulse modulation to be set up.
See page 3-43.

Return to Prior Menu — Returns to the first page of the Source menu.

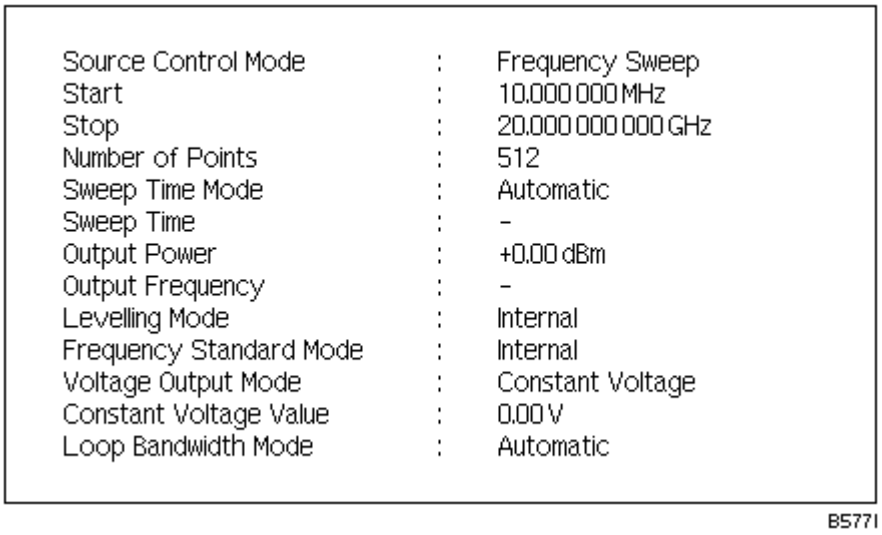


Fig. 3-5 Source display

SOURCE

Source (Center/Span Frequency Sweep Mode)

This menu enables the source to be set up to provide a linear frequency sweep by defining the center and span of the sweep.

Reverse frequency sweeps are possible by entering a negative span value.

Set Cntr Frequency

Used to change the center frequency of the sweep to a value within the range permitted for the particular instrument.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**10^{+}**

Set Span

Similar to the above but applies to the span of the frequency sweep.

Set Output Power

Used to change the output power of the source.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

Set Number of Points

Used to change the number of points generated by the sweep, up to a maximum of 1601 points.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

Sweep Time

Leads to the Sweep Time menu, which enables the sweep time to be set up manually or automatically.
See page 3-37.

Select Source Mode

Leads to the Source Mode menu, which enables CW operation or one of several sweep modes to be selected.
See page 3-38.

More

Leads to the second page of the Source menu.
See page 3-31.

SOURCE

Source
(CW Mode)

This menu enables the source to be set up to provide a continuous wave (CW) frequency. The source can also be frequency modulated.

Set Frequency

Used to change the CW frequency of the source to a value within the range permitted for the particular instrument.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**10+**

Set Output Power

Used to change the output power of the source.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

FM

Leads to the FM menu, which enables source frequency modulation to be set up.
See page 3-34.

Select Source Mode

Leads to the Source Mode menu, which enables CW operation or one of several sweep modes to be selected.
See page 3-38.

More

Leads to the second page of the Source menu.
See page 3-31.

SOURCE | FM

FM — **This menu is used for setting up frequency modulation of the source.**

External modulation is available on all instruments. Instruments with the internal modulation option fitted can also use an internal modulating source.

Note that FM is only available when the instrument is in CW mode.

FM — Toggles frequency modulation of the source on or off.

External AC — Selects the signal present at the MOD IN/OUT connector as the source of the frequency modulation.

External DC — Selects the signal present at the MOD IN/OUT connector as the source of the frequency modulation. The DC level at this input is used to vary the frequency of the source. The *[DC Null]* soft key (below) should be used to compensate for any offsets within the instrument.

Internal — Selects the instrument's internal FM generator as the source of the frequency modulation

This soft key will only be present if the Internal FM option is fitted.

Set FM Deviation — Allows the user to enter a value for the deviation of the frequency-modulated source.

Rotary Control	Step Keys	Numeric Pad	Terminator	
×	×	√		10^+

Set Internal Mod Freq — Allows the user to enter a value for the instrument's internal modulating frequency.

Rotary Control	Step Keys	Numeric Pad	Terminator	
√	√	√		10^+

This soft key will only be present if the Internal FM option is fitted, and is only selectable if Internal is selected.

DC Null — Compensates for any offsets within the instrument so that a 0 V DC level at the MOD IN/OUT connector gives zero frequency modulation

This soft key is only selectable if External DC is selected.

Return to Source — Returns to the Source menu.

SOURCE

Source (Power Sweep)

This menu enables the source to be set up to provide a linear power sweep between the start power and stop power values.

Reverse power sweeps are possible by making Start Power > Stop Power.

Set Start Power

Used to change the start power level of the source.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

Set Stop Power

Used to change the stop power level of the source.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

Set Frequency

Used to change the CW frequency of the source to a value within the range permitted for the particular instrument.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**10+**

Set Number of Points

Used to change the number of points generated by the sweep , up to a maximum of 1601 points.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**Any**

Sweep Time

Leads to the Sweep Time menu, which enables the sweep time to be set up manually or automatically.
See page 3-37.

Select Source Mode

Leads to the Source Mode menu, which enables CW operation or one of several sweep modes to be selected.
See page 3-38.

More

Leads to the second page of the Source menu.
See page 3-31.

SOURCE

Source (List Sweep) — **This menu enables the source to be set up to provide a list sweep of up to 1024 frequency points.**

Reverse sweeps are possible.

Edit List — Leads to a simple editing menu, which allows up to 1024 frequency points to be entered and/or edited.

Trigger Mode — Leads to the Trigger Mode menu, which allows the trigger mode to be selected, and manual stepping through the frequency list.
See page 3-47.

Set Output Power — Allows source power to be set.

Reverse Sweep — Allows the list sweep direction to be reversed (indicator lit): forward is the default.

Point Delay — Leads to the Point Delay menu, which enables the lock output signal to be delayed to suit external requirements.
See page 3-48.

Select Source Mode — Leads to the Source Mode menu, which enables CW operation or one of several sweep modes to be selected.
See page 3-38.

More — Leads to the second page of the Source menu.
See page 3-31.

SOURCE | Sweep Time

Sweep Time

The sweep time is the time taken for the source to complete one sweep, excluding time required for internal processing of the data. The setting determined by this menu will apply instrument-wide.

Longer sweep times may be necessary when testing certain devices, and also have the effect of reducing noise.

Automatic Sweep Time

Sets the sweep time mode of the source to automatic. In this mode, the sweep time automatically adjusts to the minimum sweep time available for the set frequency span.

User Set Sweep Time

Sets the sweep time mode to manual; the following soft key can then be pressed to allow the sweep time to be changed by the operator.

Set Sweep Time

Allows the sweep time to be entered. The instrument will generate an actual sweep time that will never be faster than the sweep time entered, but may be slower, depending on constraints imposed by the source frequency range.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**10⁻**

This key will only be selectable if manual sweep time mode has been selected

Return to Source

Returns to the Source menu.

SOURCE | **Select Source Mode**

Source Mode This menu enables the instrument's source to be set up to provide either a CW (continuous wave) output, or a swept output.

Start & Stop Freq Sweep Sets the source to the swept frequency mode of operation, in which the start and stop values of the frequency sweep, and its power level, can be defined by returning to the Source menu.

Cntr & Span Freq Sweep Similar to the above, but the sweep is defined by the center frequency and its span.

CW Sets the source to the CW mode of operation, in which the frequency and power level can be defined by returning to the Source menu.

The CW mode assumes that the source is to be used as part of an integrated measurement system (such as the 6800A Series) where the source and data acquisition system are synchronized.

Power Sweep Sets the source to the power sweep mode of operation, in which the start and stop values of the power sweep, and its frequency, can be defined by returning to the Source menu.

Return to Source Returns to the Source menu.

SOURCE | More | Leveling

Leveling **This menu is used to select the leveling mode that is used to control the output power of the 6810A Series.**

Leveling is used for power level control, via a fast, closed-loop feedback system. The control (feedback) signal used to level the output can be derived from either the internal leveling detector of the instrument, or from an external detector or power meter, connected to the rear-panel EXT LEVEL INPUT.

Internal leveling provides a constant signal at the SIGNAL SOURCE OUTPUT connector regardless of reflections by adjusting the level of the source, thus improving the source match. A further improvement in source match can be gained by using the external leveling mode, so that leveling is done, at a point in the system, closer to the test port. The emergent signal, at the leveled point in the system, is constant, regardless of the signal traveling back towards the source; in this way the source appears matched.

Int Leveling Sets the leveling mode of the source to internal.

Ext Leveling +ve Det Sets the leveling mode of the source to external, and requires a detector of positive polarity.

Ext Leveling -ve Det Sets the leveling mode of the source to external, and requires a detector of negative polarity.

Ext Leveling Power Meter Sets the leveling mode of the source to external, and requires a power meter leveling output of positive polarity.

Return to Source Returns to the Source menu.

SOURCE | More | Frequency Standard

Freq Standard — **This menu is used to select the frequency standard to be used by the instrument's synthesized source.**

Under normal circumstances the internal crystal oscillator of the instrument would be used, but if necessary, an external frequency standard of higher accuracy and stability can be connected to the FREQ STANDARD rear connector.

Int Std — Selects the internal crystal oscillator of the 6810A Series as the frequency standard. In this mode, the instrument provides a 10 MHz reference output at the FREQ STANDARD connector, derived from an internal oscillator.

Ext Std 1 MHz — Enables a 1 MHz external frequency to be used as the frequency standard.

Ext Std 10 MHz — Enables a 10 MHz external frequency to be used as the frequency standard.

Return to Source — Returns to the Source menu.

SOURCE | More | Voltage Output

Voltage O/P

The VOLTAGE OUTPUT, available on pin 1 of the rear-panel AUX connector, can be programmed to provide a 0–10 V ramp voltage, for swept frequency or power measurements, an adjustable constant bias voltage output, or a live y-axis output.

0–10 V Ramp

Sets the voltage output to provide a 0–10 V ramp voltage proportional to swept frequency or power. The output will be set to 0 V for CW mode.

Constant Voltage

Sets the voltage output to provide a constant voltage, in the range 0–10 V, as set by the *[Set Voltage]* soft key.

Set Voltage

This soft key is used to change the value of constant voltage of the voltage output.

Rotary Control √	Step Keys √	Numeric Pad √	Terminator	**10⁻**

This soft key will only be selectable for constant voltage mode.

Return to Source

Returns to the Source menu.

SOURCE | More | Loop Bandwidth

Loop Bandwidth **The loop bandwidth is the bandwidth of the frequency synthesizer phase-locked loop. This is determined by a filter in both the RF and microwave sections of the source. Low bandwidth reduces the spurious signal content of the source output but slows down the response; high bandwidth has the opposite effect. Independent loop bandwidth controls are provided for the RF and microwave frequency bands.**

Auto Toggles the loop bandwidth control between Automatic and Manual. When set to manual, the settings for the RF and microwave loop bandwidths are independently settable to Fast or Slow. In Auto mode, the loop bandwidth settings depend on the source mode in accordance with the table below:

RF setting	Microwave setting	Usage
Fast	Fast	AUTO setting for swept frequency modes
Fast	Slow	Low noise sweeps / medium speed hopping
Slow	Fast	not used
Slow	Slow	Auto setting for best phase noise in CW and power sweep modes

RF Fast The RF loop bandwidth is always FAST irrespective of the operating mode.

RF Slow The RF loop bandwidth is always SLOW irrespective of the operating mode.

Microwave Fast The microwave loop bandwidth is always FAST irrespective of the operating mode.

Microwave Slow The microwave loop bandwidth is always SLOW irrespective of the operating mode.

Return to Source Returns to the Source menu.

SOURCE | More | Pulse Mod

Pulse Mod **This menu is used for setting up pulse modulation of the source.**

Pulse Mod Enables pulse generator and modulator.

Pulse CW Turns RF on continuously, for normalizing external equipment.

Internal Selects internal pulse modulation (if Option 23 is fitted).

External Selects external pulse modulation.

Set Up Pulse Leads to the Single Pulse menu, which lets you set up pulse parameters.
See page 3-44.

Trigger Mode Leads to the Trigger Mode menu, which lets you define the trigger source.
See page 3-47.

Set Delay… Sets the delay between the trigger (internal or positive-going TTL external) and the leading edge of the modulating pulse.

Return to Source Returns to the Source menu.

SOURCE	More		Single Pulse

Single Pulse **This menu lets you set up the modulating pulse's parameters. It is displayed when the Single Pulse soft key is pressed.**

Single Pulse This menu is displayed when this soft key is pressed.

Pulse Pattern The menu on page 3-45 is displayed when this soft key is pressed.

Set Pulse Width… Lets you enter the width of the modulating pulse.

Set PRI… Lets you enter the repetition interval between modulating pulses.

Set PRF… Lets you enter the pulse repetition frequency.

Set Delay… Sets the delay between the trigger (internal or positive-going TTL external) and the leading edge of the modulating pulse.

Return to Pulse Mod Exits this menu and returns to the Pulse Mod menu.

SOURCE | More | Pulse Mod | Single Pulse

Single Pulse **This menu lets you set up the modulating pulse's parameters. It is displayed when the Pulse Pattern soft key is pressed.**

Single Pulse The menu on page 3-44 is displayed when this soft key is pressed.

Pulse Pattern This menu is displayed when this soft key is pressed.

Edit Pulse Pattern Leads to the Edit Pattern menu, which lets you set up any pattern of pulses up to 7.2 s in length.
See page 3-46.

Set Delay… Sets the delay between the trigger (internal or positive-going TTL external) and the leading edge of the modulating pulse.

Return to Pulse Mod Exits this menu and returns to the Pulse Mod menu.

SOURCE	More	Pulse Mod	Single Pulse	Edit Pattern

Moves up the modulating pulses in the pattern list.

Moves down the modulating pulses in the pattern list.

Previous Page Goes to the previous page of modulating pulses in the list.

Next Page Goes to the next page of modulating pulses in the list.

Delete Pulse Deletes the highlighted pulse.

Insert Pulse Above Inserts a copy of the highlighted modulating pulse immediately above it.

Clear Pattern Clears all the entries in the pattern list.

Save and Exit Saves the pulse pattern, exits this menu, and returns to the Single Pulse menu.

SOURCE | More | Pulse Mod | Trigger Mode

Trigger Mode **This menu lets you set up the source for the pulse modulator trigger.**

External A trigger (positive-going TTL) is applied to the rear-panel AUX socket.

internal Continuous (Option 23 only). Trigger pulses are generated internally to drive the pulse modulator. Timing parameters of the trigger pulses are set up in the Single Pulse menu or in the Edit Pattern menu.

Return to Pulse Mod Exits this menu and returns to the Pulse Mod menu.

SOURCE | Point Delay

Point Delay — **This menu is used for setting up a delay between the establishment of a new list frequency and the lock output signal being asserted (active high).**

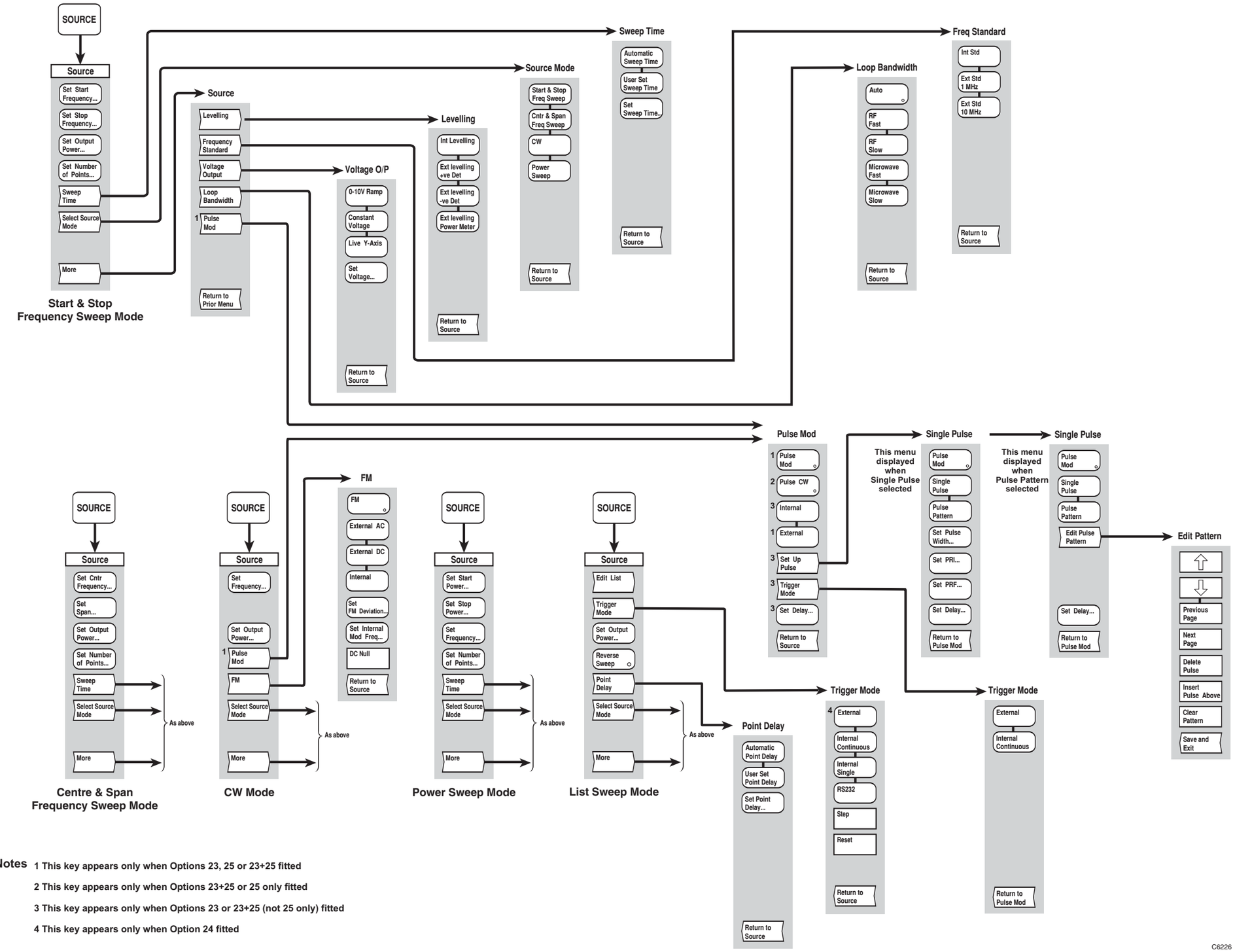
Lock (source is locked to within 10 kHz) is indicated by a positive TTL-compatible level on the LOCK OUTPUT rear-panel BNC connector.

Automatic Point Delay — The point delay is determined by the time taken to lock at each point. The software re-enables the LOCK output immediately after programming the hardware for the new frequency.

User Set Point Delay — Allows the user to determine the point delay, using the Set Point Delay setup.

Set Point Delay… — The user enters a delay time in the range 500 µs to 100 ms (default is 5 ms).

Return to Source — Returns to the Source menu.



Notes 1 This key appears only when Options 23, 25 or 23+25 fitted

2 This key appears only when Options 23+25 or 25 only fitted

3 This key appears only when Options 23 or 23+25 (not 25 only) fitted

4 This key appears only when Option 24 fitted

Fig. 3-6 SOURCE menu

Fig. 3-6 SOURCE menu

[SAVE / RECALL] key

The [SAVE/RECALL] key provides access to the menus shown in Figs. 3-7 and 3-8, which enable the current instrument settings to be saved to or recalled from a memory location specified by the user. Instrument settings can also be saved to or recalled from removable storage as MS-DOS files.

SAVE/RECALL

Save/Recall

See Fig. 3-7. **The Save/Recall menu enables instrument settings to be saved, and then recalled for use in subsequent measurements.**

The current instrument settings can be stored in a specified memory location in the instrument's internal non-volatile memory or on removable storage. Any of the stores can later be recalled in order to re-create the instrument state defined by the store contents. Facilities are available for viewing the stores without recalling them.

Save Settings

Leads to the Save Settings menu, which enables the current instrument settings to be saved to an internal store or as a file on removable storage.
See page 3-53

Recall Settings

Leads to the Recall Settings menu, which enables saved instrument settings to be recalled.
See page 3-54

Save Settings as User Default

Causes the current instrument settings to be saved to the user default settings store, after confirmation from the user.

View Inst Settings

Leads to the View Settings menu, and enables the current, default and user default settings, plus the contents of instrument settings stores, to be displayed.
See page 3-56.

SAVE/RECALL | Save Settings

Save Settings — ***See Fig. 3-7.*** **This function is used to save the current instrument settings to a memory location specified by the user, or to a file on removable storage.**

A form is displayed listing the identities of the available settings stores. To save the data to a specific settings store, the store name is selected from the list. Alternatively, a new settings store can be created by entering a new name in the appropriate entry field.

As well as the store id, its associated date and time stamp are also displayed in the list. A section at the bottom of the form will display the descriptive text for the currently selected store in the list and state whether or not it is password protected.

The settings can also be saved to removable storage as an MS-DOS file. The removable storage is accessed by using the *[USB Memory]* soft key.

Save — Saves the current instrument settings into the selected store.

⇧ — Selects the previous entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the top of the list.

This soft key will be unselectable if the highlight is at the beginning of the list.

⇩ — Selects the next entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list.

This soft key will be unselectable if the highlight is at the end of the list.

New Store Name — Enables a new settings store name to be entered.

USB Memory — When selected the list of settings stores shown will be those found in the current directory on the removable storage currently inserted in the USB port. As well as the list of settings stores any directories found in the current directory will also be shown. The [ENTER / =MKR] key is used to change directory.

Note Access to the removable storage is global to the instrument and the state is preserved across visits to all menus that can access the USB ports.

Set Store Information — Leads to the Set Store Info menu. This menu provides the same functions as the Set Store Info menu for trace memory stores.
See page 3-58.

Return to Save/Recall — Returns to the Save/Recall menu.

SAVE/RECALL | Recall Settings

Recall Settings — ***See Fig. 3-7.*** **This function is used to recall an instrument settings store. The instrument will be set up according to the stored parameters.**

A form is displayed listing the identities of the available settings stores. To retrieve the data from a specific store, it is selected from the list.

As well as the store id, its associated date and time stamp are also displayed in the list. A section at the bottom of the form will display the descriptive text for the currently selected store in the list and state whether or not it is password protected.

The settings store can also be retrieved from removable storage, which is accessed by pressing the *[USB Memory*] soft key.

Select — Retrieves the instrument settings from the selected store.

⇧ — Selects the previous entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the top of the list.

This soft key will be unselectable if the highlight is at the beginning of the list.

⇩ — Selects the next entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list.

This soft key will be unselectable if the highlight is at the end of the list.

USB Memory — When selected the list of settings stores shown will be those found in the current directory on the removable storage currently inserted in the USB port. As well as the list of settings stores any directories found in the current directory will also be shown. The [ENTER / =MKR] key is used to change directory.

Note Access to the removable storage is global to the instrument and the state is preserved across visits to all menus that can access the USB ports.

Return to Save/Recall — Returns to the Save/Recall menu.

SAVE/RECALL | Save Settings | Set Store Information

Set Store Info

See Fig. 3-7. **This menu is used to enable / disable password protection for the selected store and to enter arbitrary text to be saved with the store.**

A form is displayed showing information about the store, including whether or not it is password protected, whether or not it is in the spreadsheet format and the descriptive text.

Password Protection

Toggles password protection on / off for the store. If the protection is being turned on, a password will be prompted for. If protection is being turned off, the currently set password will be required. Note that this feature protects the selected store from being overwritten, not from unauthorised access.

Change Password

This enables the currently set password to be changed. The current password will have to be given before the new password can be entered. Once the new password has been entered it will be prompted for again as confirmation.

This soft key will be unselectable if password protection is turned off.

Enter User Text

This enables descriptive text about the store to be entered.

SAVE/RECALL | **View Inst Settings**

View Settings — ***See Fig. 3-8.*** **This function is used to view the instrument's current, preset default and user preset default settings, plus the contents of the settings stores.**

A form is displayed on the screen showing the selected settings. The *[Print]* soft key is used to output the settings to the current printer. Depending upon which type of settings are being viewed, additional functions will be available via soft keys that appear on the menu.

Current Settings — Selects the current settings as those to be viewed.

Default Settings — Selects the preset default settings as those to be viewed.

User Default Settings — Selects the contents of the user preset default settings store to be viewed.

Settings Store — Allows the contents of a selected settings store to be viewed.

If no store has been selected then all parameters will be shown as blank until a store is selected.

The functions of the next two soft keys depends on which settings have been selected. The soft keys are not present if 'Default Settings' of 'User Default Settings' are selected.

Current Settings selected

Save to Store — Leads to the Save Settings menu, which enables the current settings to be saved to a selected store.
See page 3-53.

Save Settings as User Default — Causes the current instrument settings to be saved to the user default setting store, after confirmation from the user.

Settings Store selected

Select Store — Leads to the Select Store menu, which enables the settings store to be viewed to be selected.
See page 3-57.

Recall from Store — Applies the instrument settings from the store currently being viewed.

This soft key will be unselectable if no store has been selected.

SAVE/RECALL | View Inst Settings | Select Store

Select Store ***See Fig. 3-8.*** **This menu is used to select an instrument settings store to be viewed.**

A form is displayed listing the identities of the available settings stores. To view the data in a specific settings store, the store name is selected from the list.

As well as the store id, its associated date and time stamp are also displayed in the list. A section at the bottom of the form will display the descriptive text for the currently selected store in the list and state whether or not it is password protected.

The settings stores can also be on removable storage as MS-DOS files. The removable storage is accessed by using the *[USB Memory]* soft key.

Select Retrieves the data from the selected store.

⇧ Selects the previous entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the top of the list.

This soft key will be unselectable if the highlight is at the beginning of the list.

⇩ Selects the next entry in the list of settings stores. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list.

This soft key will be unselectable if the highlight is at the end of the list.

USB Memory When selected the list of settings stores shown will be those found in the current directory on the removable storage currently inserted in the USB port. As well as the list of settings stores any directories found in the current directory will also be shown. The [ENTER / =MKR] key is used to change directory.

Note Access to the removable storage is global to the instrument and the state is preserved across visits to all menus that can access the USB ports.

Return to View Settings Returns to the View Instrument Settings menu.

SAVE/RECALL | Save Settings | Set Store Information

Set Store Info ***See Fig. 3-7.*** **This menu is used to enable / disable password protection for the selected store and to enter arbitrary text to be saved with the store.**

A form is displayed showing information about the store, including whether or not it is password protected, whether or not it is in the spreadsheet format and the descriptive text.

Password Protection Toggles password protection on / off for the store. If the protection is being turned on, a password will be prompted for. If protection is being turned off, the currently set password will be required. Note that this feature protects the selected store from being overwritten, not from unauthorized access.

Change Password This enables the currently set password to be changed. The current password will have to be given before the new password can be entered. Once the new password has been entered it will be prompted for again as confirmation.

This soft key will be unselectable if password protection is turned off.

Enter User Text This enables descriptive text about the store to be entered.

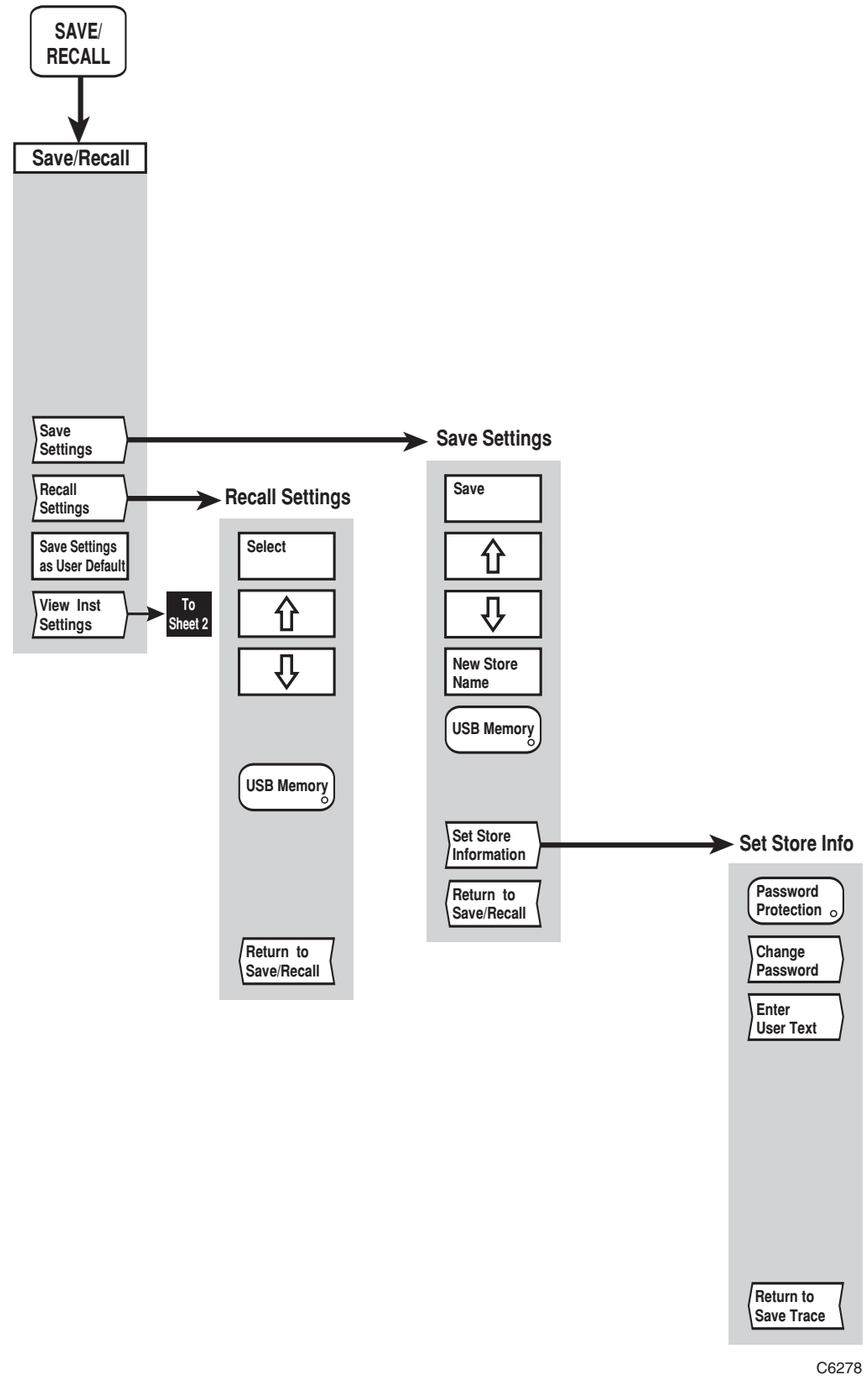


Fig. 3-7 SAVE/RECALL menus (sheet 1)

Fig. 3-7 SAVE/RECALL menus (sheet 1)

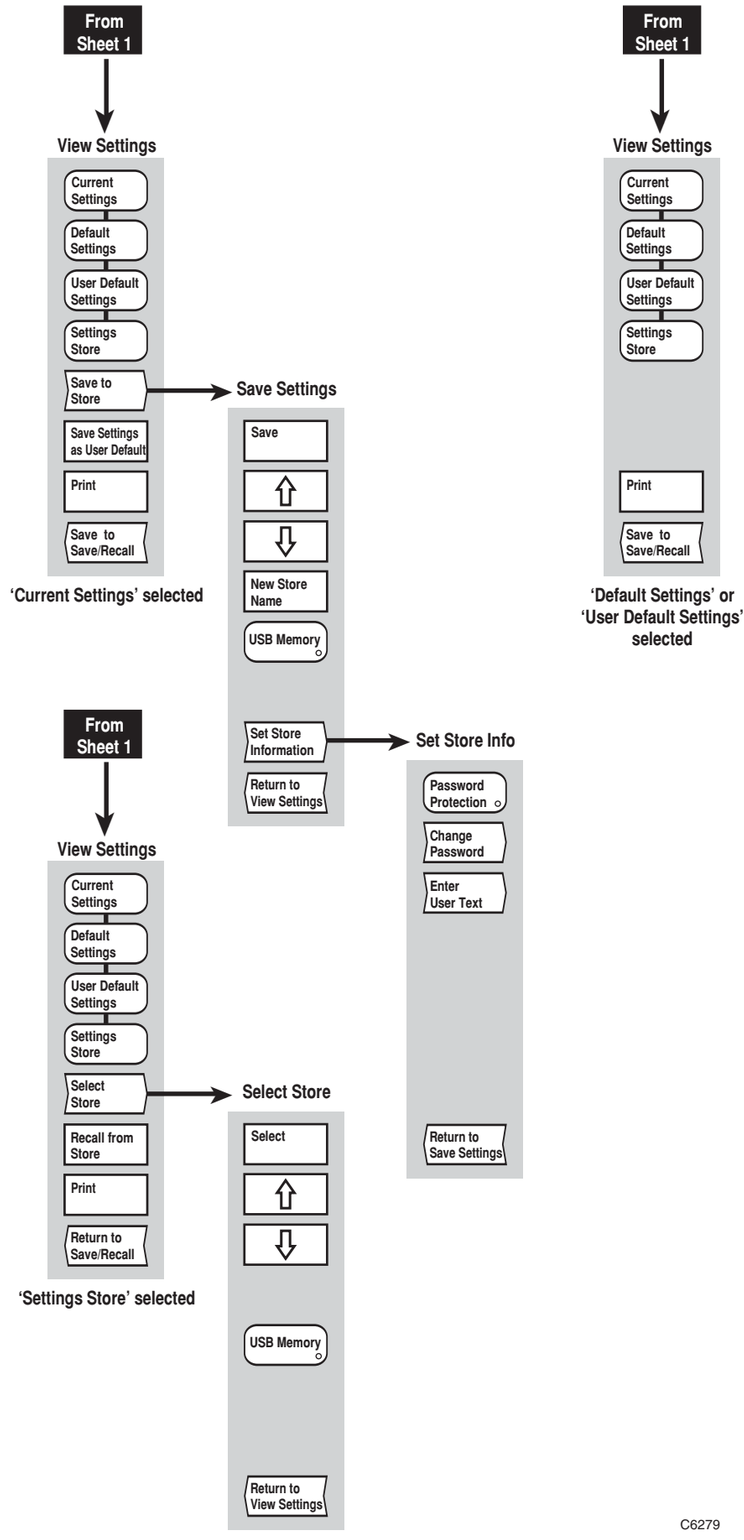


Fig. 3-8 SAVE/RECALL menus (sheet 2)

Fig. 3-8 SAVE/RECALL menus (sheet 2)

SYSTEM GROUP KEYS

[UTILITY] key

The [UTILITY] key provides access to the series of menus illustrated in Figs. 3-9 to 3-13. The menus provide utility functions, such as setting up the display and performing various system functions.

UTILITY

Utility — ***See Fig. 3-9.*** **All the soft keys in this menu lead to further menus, which provide utility functions not directly concerned with signal generation.**

Remote Control — Leads to the Remote menu, which enables the instrument to be set up for remote operation.
See page 3-64.

Security — Leads to the Security menu, which gives access to the security functions, such as setting the two user passwords.
See page 3-65.

Set Inc / Dec Steps — Leads to the Inc/Dec Steps menu, which enables the user to define the step size that is used when changing numeric parameters with the step keys and rotary control.
See page 3-66.

Store Management — Leads to the Store Mngmnt menu, which enables copying of data between internal stores and removable storage.
See page 3-67.

Service — Leads to the Service menu, which enables various system functions to be carried out, such as instrument tests, calibration and setting up the instrument according to the user's requirements.
See page 3-69.

International — Leads to the International menu, which enables the instrument to be configured for a particular country.
See page 3-80.

UTILITY **Remote Control**

Remote *See Fig. 3-9.* **This menu enables the remote control mode to be selected.**

Controlled by RS232 In this mode, the instrument will only expect to receive remote commands over the serial bus.

Controlled by GPIB In this mode, the instrument will only expect to receive remote commands over the GPIB.

No External Controller In this mode, the instrument will not expect to receive any remote commands.

Set Up RS232 Leads to the Set Up RS232 menu.

Note The number of data bits and stop bits cannot be set from here as they are defaulted when the instrument is being controlled via the RS-232.

This will be unselectable unless [Controlled by RS232] is selected.

GPIB Address Enables the GPIB address for the instrument to be set up by entering a number between 0 and 30.

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**Any**

This will be unselectable unless [Controlled by GPIB] is selected.

Restore Autotrigger Returns the instrument to auto-trigger mode if a remote command leaves it in remote trigger mode.

Return to Utility Returns to the Utility menu.

UTILITY | Security

Security — ***See Fig. 3-9.*** **This menu provides access to the security functions of the instrument.**

Secret Freq Display — Used to remove all frequency annotation from the display. The soft key has an on/off toggle action.

Lock Instrument — Used to blank the display and disable the front-panel keys and remote control. When this soft key is pressed, a 9-digit security password must be entered and then verified. The instrument remains locked until the security password is entered again, even if the instrument is switched off then on again.

Set Passwords — Leads to the Set Passwords menu, which is used to set the two user-defined passwords. This facility is primary password protected.
See page 3-65.

Return to Utility — Returns to the Utility menu.

UTILITY | Security | Set Passwords

Set Passwords — ***See Fig. 3-9.*** **A form is displayed on the screen containing the Level 1 and Level 2 user-defined passwords. The soft keys are used to select the password to be changed.**

The Set Password function requires entry of the instrument's Primary Password before the user-defined passwords can be changed.

Set Level 1 Password — Enables the Level 1 Password to be set by entering a 4-digit number in the range 1000 to 9999.

Rotary Control	Step Keys	Numeric Pad	Terminator
✕	✕	√	**Any**

Set Level 2 Password — Enables the Level 2 Password to be set by entering by entering a 6-digit number in the range 100000 to 999999.

Rotary Control	Step Keys	Numeric Pad	Terminator
✕	✕	√	**Any**

Return to Security — Returns to the Security menu.

UTILITY | **Set Inc / Dec Steps**

Inc/Dec Steps ***See Fig. 3-9.*** **This menu enables the user to define the step size that is used when changing numeric parameters with the step keys.**

A form is displayed on the screen showing a list of the step sizes and their current value. The *[⇧]* and *[⇩]* soft keys are used to move between the step sizes which can then be changed as follows:

dB

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**Any**

Freq (Chan 1), Freq (Chan 2)

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**10^{+}**

Watts, Voltage, Units

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**10^{-}**

%

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**Any**

Time

Rotary Control ✕	Step Keys ✕	Numeric Pad √	Terminator	**10^{-}**

⇧ Selects the previous entry in the list of step sizes.

This soft key will be unselectable if the highlight is at the beginning of the list.

⇩ Selects the next entry in the list of step sizes.

This soft key will be unselectable if the highlight is at the end of the list.

The function of the next two soft keys depends on which parameter has been selected.

The following additional soft key is present if frequency step is selected

Derive from Span This will derive the frequency step from the frequency span.

Return to Utility Returns to the Utility menu.

UTILITY | Store Management

Store Mngmnt — ***See Fig. 3-9.*** **This menu enables copying of data between the instrument's internal stores and removable storage. Stores (but not directories) can also be deleted.**

Stores are actually files on removable storage or on the internal flash card, which stores files in a similar way to a hard disk. When one of the soft keys is pressed, a form is displayed listing only files of the specified type; either internal or removable storage stores can be listed.

Settings — Leads to the Manage Stores menu, which allows copying or deleting of Instrument Settings stores.
See page 3-68.

Power Cals — Leads to the Manage Stores menu, which allows copying or deleting of Power Calibration stores.
See page 3-68.

Return to Utility — Returns to the Utility menu.

UTILITY	Store Management	Settings
UTILITY	Store Management	Power Cals

Manage Stores *See Fig. 3-9.* **This menu is used to copy data between the instrument's internal stores and removable storage. Stores (but not directories) can also be deleted.**

A form is displayed listing stores of the relevant type, i.e. according to the soft key pressed in the previous menu. If the removable storage is not selected, i.e. the indicator on the *[USB Memory]* soft key is not lit, the list will show the instrument's internal stores.

If the *[USB Memory]* soft key is pressed so that the indicator is lit, stores on the removable storage will be listed. Directories on the removable storage are indicated by enclosing their names in square brackets. A directory is entered by highlighting it using the *[⇧]* and *[⇩]* soft keys then pressing the *[Change Directory]* soft key. The first soft key in this menu is labeled *[Delete]* when a store is highlighted and *[Change Directory]* when a directory is highlighted. To go back to the previous level highlight [**..**] and press *[Change Directory]*. Selecting [**.**] re-displays the list to reflect any changes that have been made. The *[Select USB Memory Path]* soft key is used to specify the destination directory when copying to removable storage; only directories are listed,

A store is deleted by highlighting it using the *[⇧]* and *[⇩]* soft keys and pressing *[Delete]*.

To copy a store, it is selected as described above; if the store is on removable storage the destination will be internal store and vice versa. Pressing the *[Copy]* soft key performs the copy operation.

Delete or **Change Directory** — Deletes the highlighted store. / Lists the stores in the highlighted directory.

⇧ — Selects the previous entry in the store/directory list.

This soft key will be unselectable if the highlight is at the beginning of the list.

⇩ — Selects the next entry in the store/directory list.

This soft key will be unselectable if the highlight is at the end of the list.

Copy — Copies the selected store to the specified destination.

USB Memory — When selected, the list of memory stores shown will be those found in the current directory on the removable storage currently inserted in the USB port. As well as the list of memory stores any directories found in the current directory will also be shown. The [ENTER / =MKR] key is used to change directory.

Note Access to the removable storage is global to the instrument and the state is preserved across visits to all menus that can access the USBports.

Select USB Memory Path — When this soft key is pressed, only directories on the removable storage are listed. A sub-menu is displayed containing *[⇧]*, *[⇩]* and *[Change Directory]* soft keys; these are used to set the destination path when copying to removable storage.

This soft key is only selectable when USB Memory (above) is not selected.

Return to Store Mngmnt — Returns to the Store Mngmnt menu.

UTILITY | Service

Service ***See Fig. 3-11*. This menu provides various service functions.**

Set-up Leads to the Set-up menu, which provides several instrument setup functions.
See page 3-70.

Status Leads to the Status menu, which allows the user to examine the power on test results and the build state of the instrument.
See page 3-73.

Instrument Calibrations Leads to the Instrument Cals menu, which provides calibration facilities for the instrument.
See page 3-74.

Tests Leads to the Tests menu, which enables display and keyboard tests to be performed.
See page 3-79.

Upgrade Instrument Used to install upgraded software for the instrument, supplied on removable storage. When this soft key is pressed, the user is prompted to insert the storage device and press *[Continue}* when ready. The instrument must be turned off then on again to complete the installation. This facility is Primary Password protected.

Diagnostics Provides some basic functions for diagnosing hardware faults.

Return to Utility Returns to the Utility menu.

UTILITY | Service | Set-up

Set-up — ***See Fig. 3-12*. This menu provides facilities for setting up the display and setting the instrument's real-time clock.**

Display — Leads to the Display menu, which enables the display brightness to be set, and also provides a screen blanking facility.
See page 3-71.

Set Date & Time — Leads to the Date & Time menu, which is used for setting the instrument's real time clock.
See page 3-72.

Reset Op Hours Clock — This is used to reset the instrument operating hours count to zero. Primary Password protected.

Set Serial Number — This is used to set the instrument's serial number. Primary Password protected.

Set 6810 Series Options — Allows the instrument's hardware options to be specified. Primary Password protected.

Return to Service — Returns to the Service menu.

UTILITY | Service | Set-up | Display

Display — ***See Fig. 3-12.*** **This menu provides facilities for setting up aspects of the instrument's LCD.**

Maximum Brightness	Sets the LCD backlight to maximum brightness.
High Brightness	Sets the LCD backlight to high brightness.
Low Brightness	Sets the LCD backlight to low brightness.
Minimum Brightness	Sets the LCD backlight to minimum brightness.
Colour Palettes	Leads to the Color Palette menu that enables a new set of colors to be selected. *See page 3-71.*
Return to Set-up	Returns to the Utility menu.

UTILITY | Service | Set-up | Display | Color Palettes

Colour Palettes — ***See Fig. 3-12.*** **This menu allows the color scheme used by the display to be selected.**

Colour	Selects the color display.
White on Black	Selects the white on black display.
Black on White	Selects the black on white display.
Green on Black	Selects the green on black display.
Monochrome	Selects the grayscale display.
Return to Display	Returns to the Display menu.

UTILITY | Service | Set-up | Set Date & Time

Date & Time ***See Fig. 3-12*. This function is used to set the instrument's real-time clock and calendar.**

A form is displayed on the screen showing the current time and date, together with soft keys for parameter selection. The instrument's date and time are not changed until the *[Store Date & Time]* soft key is pressed.

Enter Time

Allows a new time to be entered. The hour field will be selected initially. The pressing of a terminator key will move the selection to the next time field.

Rotary Control	Step Keys	Numeric Pad	Terminator	
✗	✗	√		**Any**

Enter Date

Allows a new date to be entered. The day (or month, depending upon the country selection) field will be selected initially. The pressing of a terminator key will move the selection to the next date field.

Rotary Control	Step Keys	Numeric Pad	Terminator	
✗	✗	√		**Any**

Store Date & Time

Causes the entered date and time to be checked. If the checks fail a message will be displayed and the error must be corrected before the new date and time will be accepted. If the checks pass then the instrument's real-time clock and calendar will be updated with the entered values.

Return to Set-up

Returns to the Set-up menu. If the currently entered date and time have not been stored then the instrument will display a prompt asking if they are to be saved.

UTILITY | Service | Status

Status ***See Fig. 3-11.*** **This menu allows the user to examine the power-on test results and the build state of the instrument and its boards.**

Display Test Results Displays the results of the tests that the instrument performs when it is switched on. The instrument maintains records in non-volatile memory of the time and date of the most recent failure for each test.

Erase Test Results Clears the power on test results, i.e. sets all the tests to 'pass'. This function is confirmation protected.

Display Build State Displays the build state of the instrument, including the total number of hours that the instrument has been operating, and the time and data of the most recent frequency standard cal and power reference cal. A *[Print]* soft key is displayed which enables a hard copy printout to be obtained.

Display Patent Information Lists any patents relating to the 6810A Series instruments.

Get ID ROM Details Displays build state information for each printed circuit board within the instrument, which is held in ROM.

Return to Service Returns to the Service menu.

UTILITY | Service | Instrument Calibrations

Instrument Cals ***See Fig. 3-13.*** **This menu provides facilities for self-calibration of the instrument.**

The calibration process is controlled automatically by the instrument. For operations taking more than a few seconds to complete, a percentage complete indicator will be displayed after the function has been initiated.

When operating the unit at the extremes of its rated temperature range, particularly below -10°C, it may be necessary to perform a User Frequency Cal of the RF Source. This occurs because the lock range of the synthesizers is much less than the total tuning range, and stored pre-steer correction voltages are derived by the calibration routine to achieve lock. The prompt for performing the user cals is indicated by the flashing 'Unloc' indicator at the top of screen.

Before initiating the calibration routine it is useful to determine first which part of the unit is generating the 'Unloc' indication. This is achieved with the following key presses:
[UTILITY] *[Service] [Diagnostics] ['Unloc' Diagnostics]*

The flashing 'Unloc' will be replaced by six dashes (------) while there is no 'Unloc' indication and one or more of the dashes will be replaced by an upper case letter in the range A to F in place of the 'Unloc'.

The letters A, B or C indicate the 'Unloc' is in the RF Source;
the letters D or E are not used.
The letter F refers to the 10MHz frequency standard module.

The User Cal is performed in each case by selecting the appropriate menu and initiating the user cal by pressing the *[Perform Frequency Cal]* softkey. No additional connection or disconnection of front panel cables is required to do this as it is performed automatically by the instrument's software.

RF Source Calibrations Leads to the RF Source Cals menu.
See page 3-75.

Return to Service Returns to the Service menu.

UTILITY | Service | Instrument Calibrations | RF Source Calibrations

RF Source Cals — ***See Fig. 3-13.*** **This menu provides facilities for calibrating the instrument's source and internal frequency standard.**

Frequency Standard Cal — Used to calibrate the instrument's internal frequency standard against an external standard. The user is prompted to connect the external standard to the FREQ STANDARD INPUT/OUTPUT connector on the rear panel and press *[Continue]* when ready. Pressing *[Abort]* terminates the calibration process.

This facility is User Level 2 Password protected.

Perform Frequency Cal — Calibrates the oscillators of the instrument's source.

Broadband Power Cal — Used to carry out a power calibration of the instrument's source over its full frequency range. This facility is User Level 1 Password protected.

Leads to the Bband Power Cal menu.
See page 3-76.

Narrowband Power Cal — Used to carry out a power calibration of the instrument's source over a limited frequency range. This facility is User Level 1 Password protected.

Leads to the Nband Power Cal menu.
See page 3-77.

Power Cal Functions — Leads to the Power Cal Funcs menu.
See page 3-78.

Perform FM Cal — Used to calibrate the frequency modulation circuits of the instrument’s source.

Return to Instrument Cals — Returns to the Instrument Cals menu.

UTILITY | Service | Instrument Calibrations | RF Source Calibrations | Broadband Power Cal

Bband Power Cal *See Fig. 3-13.* **This menu is used to perform a broadband power calibration of the instrument's source, i.e. over its full frequency range.**

The user is prompted to connect a detector (6230A/L series) to INPUT A and to the SIGNAL SOURCE OUTPUT connector and press *[Continue]* when ready. The *[Select Power Cal Store]* soft key is used to save the calibration data to a specified store.

Note Instead of calibrating at the SIGNAL SOURCE OUTPUT connector, calibration may be carried out at the output of any cables, adapters, etc. that are connected to the signal source output.

Continue Initiates the broadband power calibration

Pulse Mod Cal This soft key appears only when Option 25 is fitted. Carry out the standard broadband calibration as indicated above, then press this key. Carry out a repeat broadband calibration that now takes into account the different signal routing for pulse modulated signals.

Select Power Cal Store Leads to the Select Store menu.
See page 3-76

Abort Terminates the calibration process.

UTILITY | Service | Instrument Calibrations | RF Source Calibrations | Broadband Power Cal | Select Power Cal Store

Select Store *See Fig. 3-13.* **This menu is used to select a store in which to save calibration data.**

A form is displayed listing the identities of the available calibration stores (either broadband or narrowband). To save the data to a specific calibration store, the name is selected from the list. Alternatively, a new calibration store can be created by entering a new name in the appropriate entry field.

Select Saves the power calibration data to the selected store.

⇧ Selects the previous entry in the list of calibration stores. The list automatically scrolls, if necessary, when the highlight reaches the top of the list.

This soft key will be unselectable if the highlight is at the beginning *of the list.*

⇩ Selects the next entry in the list of calibration stores. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list.

This soft key will be unselectable if the highlight is at the end of the list

New Store Name Enables a new calibration store name to be entered.

Return to Calibration Returns to the previous menu.

UTILITY | Service | Instrument Calibrations | RF Source Calibrations | Narrowband Power Cal

Nband Power Cal *See Fig. 3-13.* **This menu is used to perform a narrowband power calibration of the instrument's source, i.e. over a user-defined frequency range.**

The narrowband calibration facility enables a power calibration to be performed over a limited frequency range. This makes it possible to calibrate the instrument at the output of frequency selective devices such as filters and amplifiers.

A window is displayed showing the frequency range the calibration will cover (initially the entire range of the source). The frequency range is specified using the *[Set Start Frequency]* and *[Set Stop Frequency]* soft keys. The user is prompted to connect a detector (6230A/L series) to INPUT A and to the SIGNAL SOURCE OUTPUT connector and press *[Continue]* when ready. The *[Select Power Cal Store]* soft key is used to save the calibration data to a specified store.

Note Instead of calibrating at the SIGNAL SOURCE OUTPUT connector, calibration may be carried out at the output of any cables, adapters, etc. that are connected to the signal source output.

Pulse Mod Cal This soft key appears only when Option 25 is fitted. Carry out the standard broadband calibration as indicated above, then press this key. Carry out a repeat broadband calibration that now takes into account the different signal routing for pulse modulated signals.

Continue Initiates the narrowband power calibration.

Set Start Frequency Sets the lower limit of the calibration frequency range.

Set Stop Frequency Sets the upper limit of the calibration frequency range.

Select Power Cal Store Leads to the Select Store menu.
See page 3-76

Abort Terminates the calibration process.

UTILITY | Service | Instrument Calibrations | RF Source Calibrations | Power Cal Functions

Power Cal Funcs ***See Fig. 3-13.*** **This menu provides additional power calibration functions.**

Transfer to Primary Cal Transfers a user power calibration into the primary calibration store (contains the factory-generated power calibration data). A sub-menu is displayed which allows selection of the user power calibration store to be transferred. This is similar to the Select Store menu (page 3-76) except that there is no *[New Store Name]* soft key. This function is Primary Password protected.

Select User Power Cal Used to select which user power calibration is to be used in the instrument. A sub-menu is displayed which allows selection of the user power calibration store. This is similar to the Select Store menu (page 3-76) except that there is no *[New Store Name]* soft key.

Select Primary Power Cal Selects the primary calibration. Power calibration data stored in the primary cal store will be used in the instrument for non-pulse mode operation.

Transfer to Pulse Mod Cal Transfers a user power calibration into the pulse modulation calibration store (contains the factory-generated power calibration data). A sub-menu is displayed which allows selection of the user power calibration store to be transferred. This is similar to the Select Store menu (page 3-76) except that there is no *[New Store Name]* soft key. This function is Primary Password protected.

Select User Pulse Mod Cal Used to select which user power calibration is to be used in the instrument. A sub-menu is displayed which allows selection of the user pulse modulation calibration store. This is similar to the Select Store menu (page 3-76) except that there is no *[New Store Name]* soft key.

Select Primary Pulse Mod Cal Selects the primary pulse modulation calibration. Power calibration data stored in the primary pulse mod cal store will be used in the instrument for pulse mode operation.

Return to RF Src Cals Returns to the RF Source Cals menu.

UTILITY | Service | Tests

Tests — ***See Fig. 3-11.*** **This menu enables the operator to verify that the display and keyboard are functioning correctly.**

Test Keyboard — Allows each key on the front panel to be tested individually, and allows the rotary control to be tested for clockwise and anti-clockwise rotation.

A form is displayed on the screen containing a representation of the front-panel key layout. For each keypress or rotary control movement detected, the corresponding symbol on the front-panel representation will be highlighted, and remains highlighted for the duration of the test. The *[Exit]* soft key terminates the test.

Test Display — Leads to the Test Display menu.
See page 3-79.

Return to Service — Returns to the Service menu.

UTILITY | Service | Tests | Test Display

Test Display — ***See Fig. 3-11.*** **This menu enables the operator to verify that all the display pixels are functioning correctly.**

Pixel Off — Causes all the pixels on the display to be turned off. The test is used to indicate 'stuck on' pixels on the LCD.

Pixel On — Causes all the pixels on the display to be turned on at maximum brightness. The test is used to indicate 'stuck off' pixels on the LCD.

Remove menu — Removes the menu from the instrument display so that the test pattern covers the whole of the LCD. Pressing any key will restore the menu.

Exit — Returns to the Tests menu.

UTILITY International

International

***See Fig. 3-10*. This function enables the following country-specific instrument settings to be set:**

Language - text is displayed in the selected foreign language, and supports the special character requirements of French, German and Spanish.

Keyboard layout - If an external keyboard is used, the layout can be specified according to the country.

Date format - Different date formats can be specified (e.g. 03/8/2008, 03.8.2008).

Time Format - Different time formats can be specified (e.g. 17:35:20, 5:35:20p).

Decimal point - The decimal point can be either a full stop or a comma (if a comma is selected the spreadsheet field separator will be automatically set to semicolon to avoid ambiguity).

Spreadsheet separator - When creating files in Spreadsheet (CSV) format, either a comma or semicolon can be used as a field separator.

Although it is possible to change the international settings independently, as above, default combinations can be set by setting the **Country** parameter to the required country, as shown below:

	UK	France	Germany	Spain	USA
Language	English	French	German	Spanish	English (US)
Keyboard	British	French	German	Spanish	US
Date & Time format	03/8/2008 17:35:20	03.8.2008 17:35:20	03.8.2008 17:35:20	03/8/2008 17:35:20	03/8/2008 5:35:20p
Spreadsheet	a, b, c,	a; b; c;	a; b; c;	a; b; c;	a, b, c,
Decimal Point	1.5	1,5	1,5	1,5	1.5

A form is displayed on the screen showing the current settings. The *[⇧]* and *[⇩]* soft keys are used to move between the parameters. A list of the available values for the highlighted parameter appears below the parameters section of the form. The *[Change]* soft key is used to move the highlight into the selection list so that a new value for the parameter can be selected, by pressing *[Select]*. The *[Go to Param Selection]* soft key moves the highlight back into the parameters section.

The functions of the soft keys depend on whether or not a parameter has been selected.

No parameter selected

Change	Moves the selection highlight into the parameter values list.
⇧	Selects the previous parameter.
⇩	Selects the next parameter.

Install New Locale	Leads to the New Locale menu, which enables new country setting to be installed from removable storage. *See page 3-81*

Parameter selected

Select	Sets the parameter to the currently selected value in the list.
⇧	Selects the previous entry in the list of values. The list automatically scrolls, if necessary, when the highlight reaches the top of the list. *This soft key will be unselectable if the highlight is at the beginning of the list*
⇩	Selects the next entry in the list of values. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list. *This soft key will be unselectable if the highlight is at the end of the list*
Go to Param Selection	Causes the selection highlight to move to the parameters section of the form

Return to Utility	Returns to the Utility menu.

UTILITY **International** **Install New Locale**

New Locale	***See Fig. 3-10*. This menu is used to install a new set of country settings from removable storage.** A form is displayed that shows the list of country settings that are on the removable storage.
Add	Copies the currently highlighted country setting to the instrument.
⇧	Selects the previous entry in the list of country settings. The list automatically scrolls, if necessary, when the highlight reaches the top of the list. *This soft key will be unselectable if the highlight is at the beginning of the list.*
⇩	Selects the next entry in the list of country settings. The list automatically scrolls, if necessary, when the highlight reaches the bottom of the list. *This soft key will be unselectable if the highlight is at the end of the list.*
Return to International	Returns to the International menu.

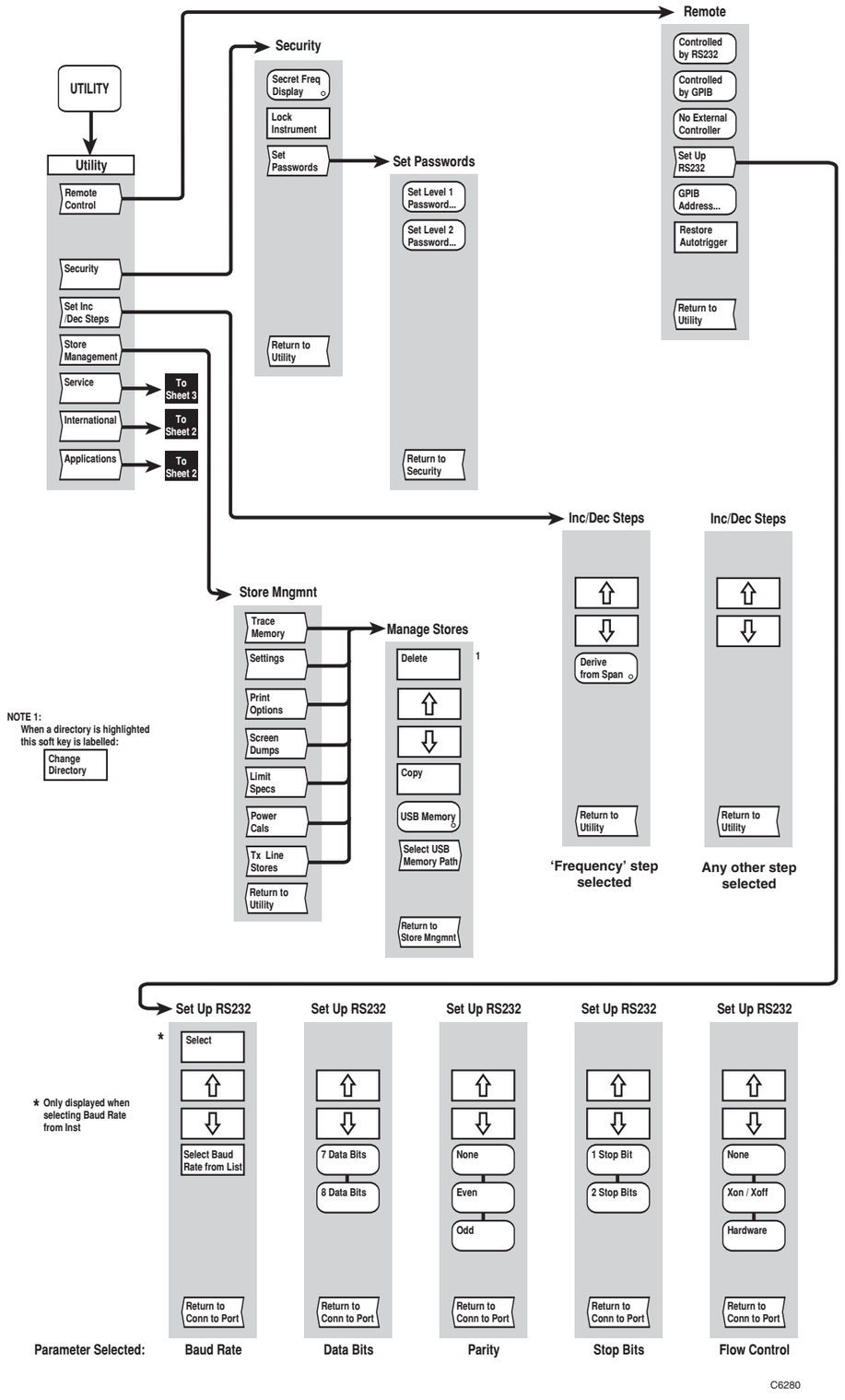


Fig. 3-9 UTILITY menus (sheet 1)

Fig. 3-9 UTILITY menus (sheet 1)

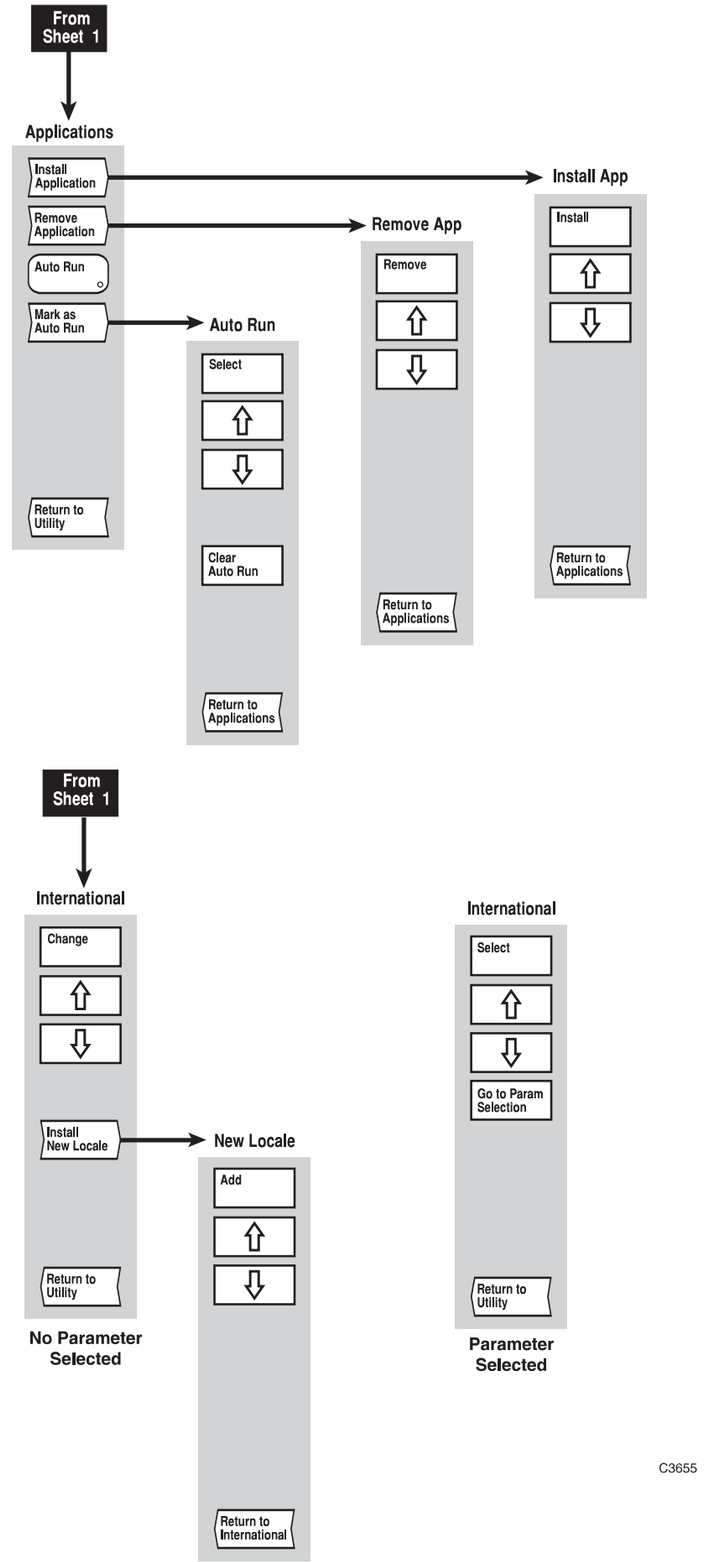


Fig. 3-10 UTILITY menus (sheet 2)

Fig. 3-10 UTILITY menus (sheet 2)

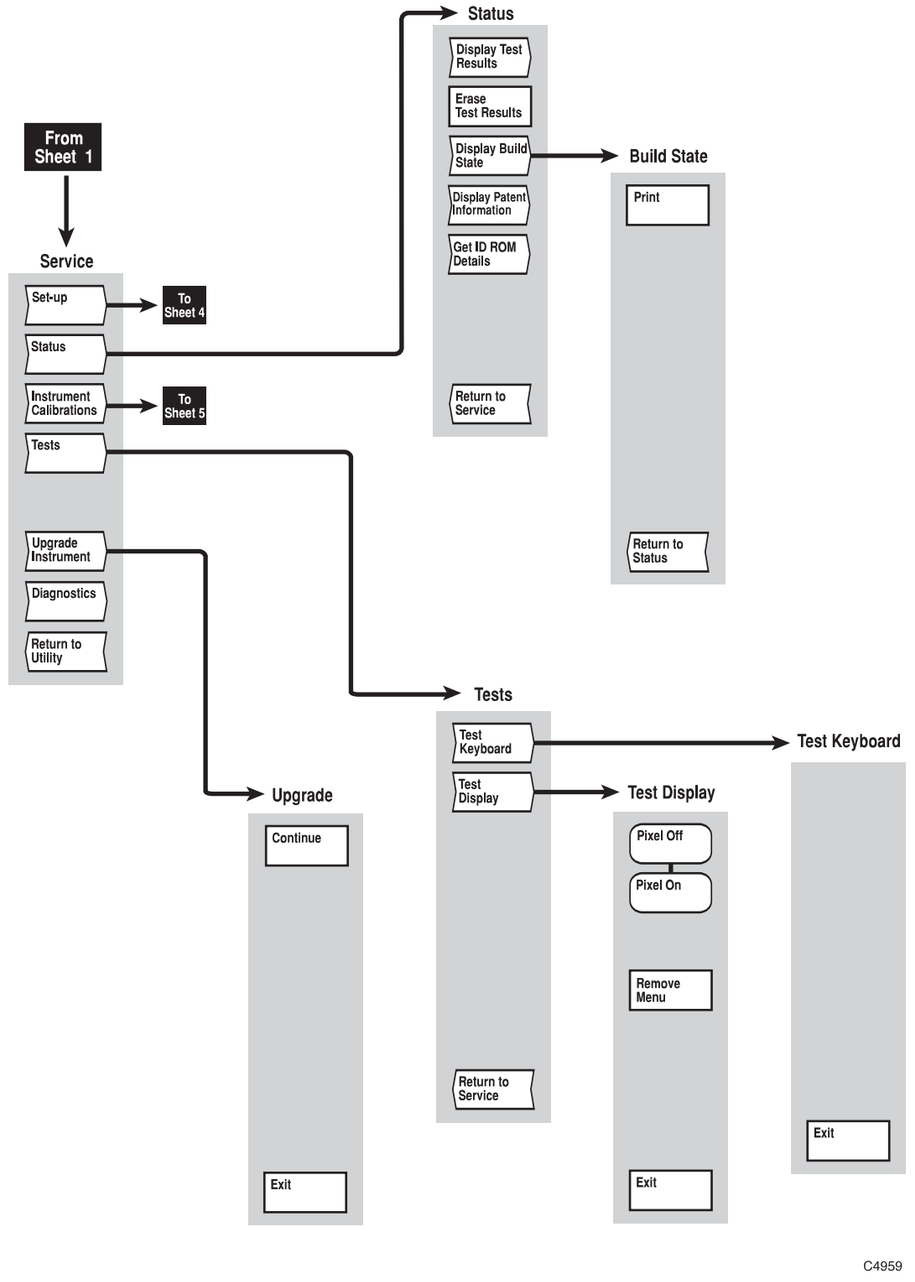


Fig. 3-11 UTILITY menus (sheet 3)

Fig. 3-11 UTILITY menus (sheet 3)

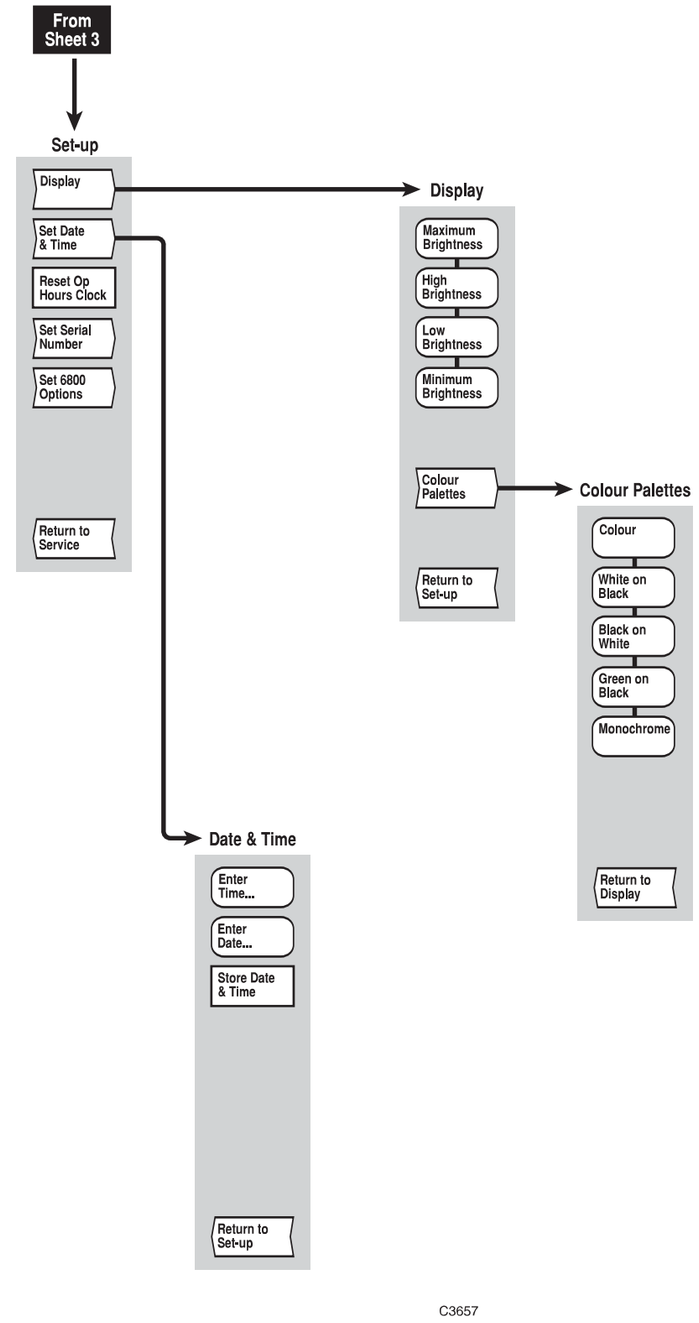


Fig. 3-12 UTILITY menus (sheet 4)

Fig. 3-12 UTILITY menus (sheet 4)

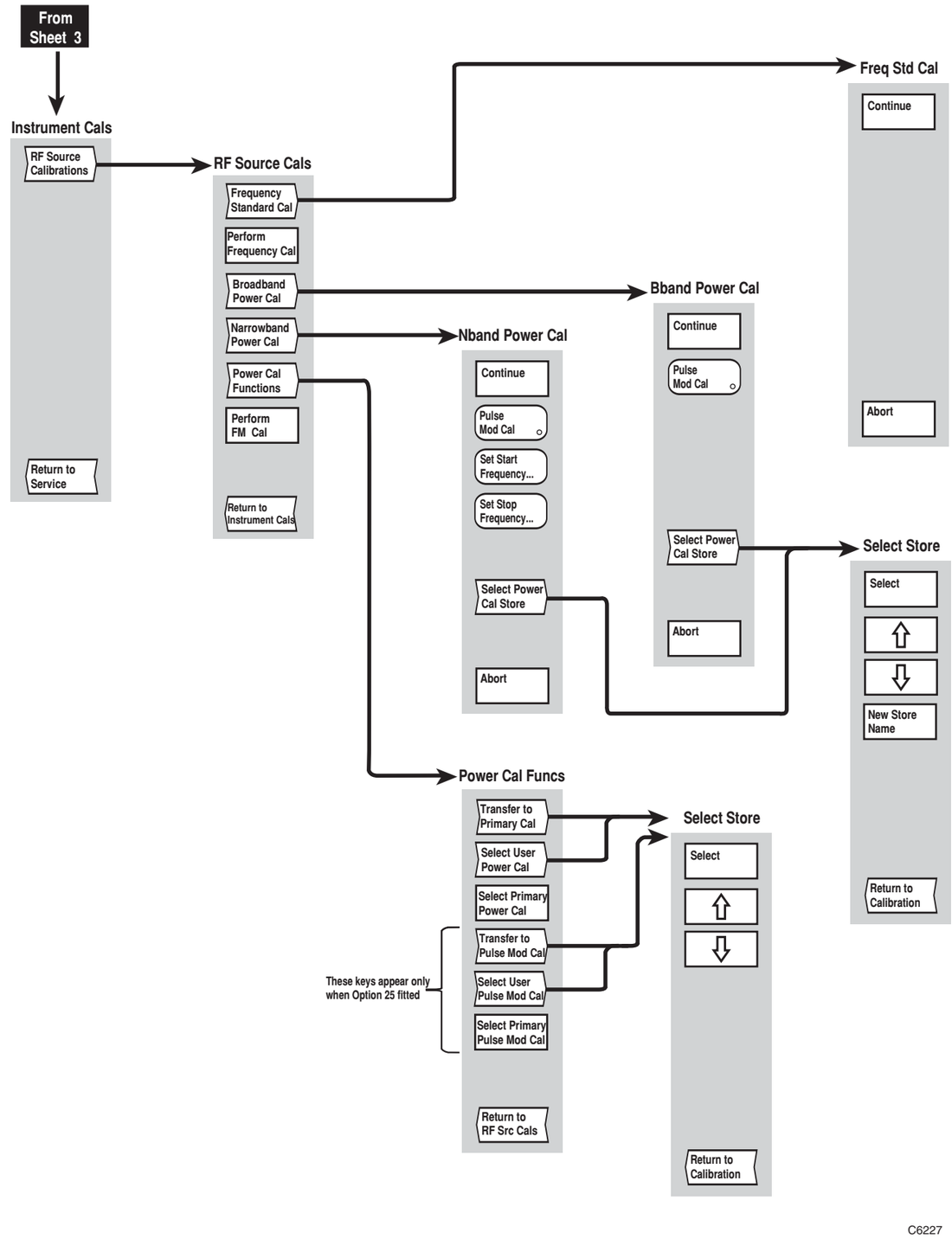


Fig. 3-13 UTILITY menus (sheet 5)

Fig. 3-13 UTILITY menus (sheet 5)

[PRESET] key

The [PRESET] key provides a menu that enables the instrument to be set to a known condition.

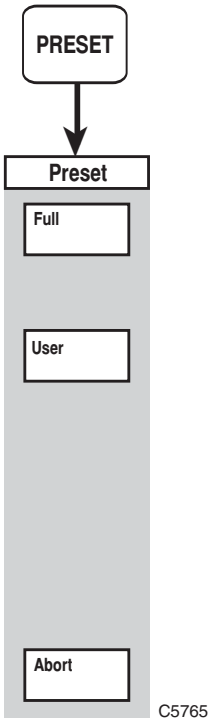


Fig. 3-14 PRESET menu

PRESET

Preset **This menu is used to set the instrument into a known state.**

If an application will be automatically run after the preset operation then a message will be displayed giving the application's name.

Full Returns the instrument to its default set-up conditions, as detailed in Appendix A.

User Sets the instrument to the conditions defined by the contents of the user default settings store (see Save/Recall menu, *[Save Settings as User Default]* soft key).

This soft key will be unselectable if the preset setting stores does not contain valid data.

Abort Aborts the preset operation.

[LOCAL] key

The [LOCAL] key does not have an associated menu structure. It is used to return the instrument to local (front panel) operation after being put into the remote state by a controller. If the instrument was being triggered by the controller, then a prompt will appear asking whether or not the instrument is to be returned to the autotrigger mode of operation.

This is the only front-panel key that is not disabled when the instrument is remotely controlled over the serial bus or GPIB. The exception to this is when local lockout is in effect; this is a remote command that disables the [LOCAL] key making it difficult to interfere with the instrument while it is under remote control.

[SOURCE ON/OFF] key

The [SOURCE ON/OFF] key does not have an associated menu structure. It is used to toggle the instrument's RF output on and off.

Chapter 4
REMOTE OPERATION

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Introduction

6810A Series instruments are equipped for remote operation via the GPIB interface or the RS-232 (serial) interface. The GPIB (General Purpose Interface Bus) interface provides instrument control with full talk and listen capability. The command syntax for both GPIB and RS-232 conforms to IEEE 488.2. The commands are common to both interfaces.

Before operating the instrument under remote control, the reader should already be familiar with setting up the instrument and with the general operation of the GPIB/serial interfaces.

Background to the GPIB

The GPIB is a high-performance bus that allows instruments and computers to be combined into integrated test systems. The bus and its associated interface operations are defined by the IEEE 488.1 standard. The later IEEE 488.2 standard defines the interface capabilities of instruments and controllers in a measurement system. This standard also defines a set of commands that a device must accept, and programming errors that a device must recognize and report.

The cables that link the devices on the bus consist of 16 signal lines, which are divided into three groups:

Data bus: This comprises eight signal lines, which are used to send data from one device to another. Programming commands and data sent on these lines is typically in the form of ASCII characters, although binary encoding is often used when transferring large amounts of data.

Handshake lines: The transfer of each byte of information over the data bus is controlled by a three-wire handshake process between the source of the data (talker) and all the destination device interfaces (listeners). This forces data transfers to occur at the speed of the slowest device, and ensures data integrity in multiple listener transfers. The handshake cycle is usually performed automatically and is transparent to the GPIB programmer.

Control lines: Five control lines (or interface management lines) are used to both send bus commands and to address devices

Devices that send data over the data lines are called *talkers*; devices that receive data over the same lines are called *listeners*. *Controllers* are devices that use the control lines to specify the talker and listener in a data exchange. A GPIB system can contain more than one device with controller capabilities, but only one is allowed to control data exchanges at any given time. The device currently controlling data exchanges is called the *active controller*. One of the controller-capable devices can be designated as the *system controller*, which can take control of the bus even if it is not the active controller. Up to 15 instruments can be connected to a GPIB system.

GPIB addresses are used to identify devices on the bus. The active controller uses these addresses to specify which device talks (via a Talk Address) and which device listens (via a Listen Address) during a data exchange. Each device must therefore have a unique address, and is set on the instrument itself, using either a front-panel key sequence or a rear-panel switch. Any given device address can specify two corresponding address codes, a Talk Address and a Listen Address. The decimal equivalent of the allowable address range is 0 to 30 inclusive.

SCPI 1990.0 compatibility

Commands are divided into a number of subsystems. Each subsystem contains groups of related commands.

The form of the subsystems owes much to the ideas contained in the Standard Commands for Programmable Instruments standard, SCPI 1990.0, and the STATus subsystem and its associated Status Reporting Structures conform to that standard.

Other subsystems are instrument-specific, although some of the features of SCPI, such as the conventions for naming and organizing commands, have been adopted.

Compound headers

Compound headers allow a complex set of commands to be built up from a smaller set of basic elements in a "tree" structure. The elements of a compound header are separated by a colon " : ". Each subsystem in this instrument is organized as a separate tree structure.

The use of compound headers brings a number of advantages. Commands are less cryptic compared with a traditional "flat" instrument command set, and compound header elements may appear more than once.

Example:

SOURce
:FREQuency
:CENTer\?
:CENTre\?
:CW\?
:SPAN\?
:STANdard\?
:STARt\?
:STOP\?
:POWer
:LEVel\?
:STARt\?
:STOP\?

Here the compound header elements "STARt" and "STOP" appear for both the frequency and power functions. Although it is possible to use the full compound header starting from the tree root every time, for example

SOURCE:POWER:START 2; SOURCE:POWER:STOP 10 ,

sequences of <COMMAND MESSAGE UNITS> and <QUERY MESSAGE UNITS> can often be shortened by taking advantage of the special rules that apply to compound headers. For example, having descended the tree to create the <PROGRAM MESSAGE UNIT> SOURCE:POWER:START 2, any other elements at that level may be included in the <PROGRAM MESSAGE> without repeating the entire path through the tree.

Example:

SOURCE:POWER:START 2;STOP 10

is equivalent to the two <PROGRAM MESSAGES>:

SOURCE:POWER:START 2 and SOURCE:POWER:STOP 10.

Note the use of the <PROGRAM MESSAGE UNIT SEPARATOR> character " ; " between <PROGRAM MESSAGE UNITS>.

Here is another example, this time using commands from the SYSTem subsystem (page 4-107).

Example:

SYSTEM:SERIAL:BAUD 9600;BITS 8

is equivalent to the two <PROGRAM MESSAGES>:

SYSTEM:SERIAL:BAUD 9600 and SYSTEM:SERIAL:BITS 8

To return to the top of the tree so that another "branch" may be descended, a colon is used.

Example:

SYSTEM:SERIAL:BAUD 9600;BITS 8;:SYSTEM:DATE 1998, 8, 20

Default branches

Some elements within the compound header tree structure are enclosed within square brackets, " [" and "] ". These elements may be omitted, if desired, to reduce the length of the compound header.

Abbreviations

In general, compound header elements have a long and a short form. Following the convention adopted in SCPI, the short form of the element is printed in upper case characters, with any remaining characters in lower case. (This is merely a convenient way of showing both forms. The instrument does not distinguish between upper and lower case characters within a header).

Example:

FREQuency

The short form is "FREQ" and the long form "FREQUENCY". Other abbreviations such as "FRE" or "FREQUEN" are not allowed.

Program data

The following program data functional elements are accepted by the instrument:

<CPD> (also known as <CHARACTER PROGRAM DATA>)

<NRf> (also known as <DECIMAL NUMERIC PROGRAM DATA>)

<STRING PROGRAM DATA>

<ARBITRARY BLOCK PROGRAM DATA>

<BOOLEAN PROGRAM DATA>

All these functional elements, with the exception of <BOOLEAN PROGRAM DATA>, are defined in IEEE 488.2.

The following informal definitions are provided as a guide:

<CPD>

Character program data is used to set a parameter to one of a number of states that are best described by short alphanumeric strings.

In this manual <CPD> strings are shown using the same conventions for abbreviation as program headers; the part of the string printed in upper case characters being the short form.

<NRf>

Flexible numeric representation (also known as <DECIMAL NUMERIC PROGRAM DATA>) covers integer and floating point representations. No suffixes (e.g. kHz) are allowed

Examples:

-466	Integer value.
4.91	Explicitly placed decimal point.
59.5E+2	Mantissa and Exponent representation

The format is known as "flexible" because any of the three representations may be used for any type of numeric parameter.

Example:

Suppose a parameter requires an integer value in the range 1 to 100, and the user wishes to set its value to 42, the following values will be accepted by the instrument.

42	integer

42.0	Floating point.
4.2E1, 4200E-2	Floating point - Mantissa/exponent.
41.5	Rounded up to 42
42.4	Rounded down to 42

<NUMERIC VALUES>

This is an extension of the <NRf> format allowing suffixes and special forms as follows:

<NRf>

<NRf>+<SUFFIX PROGRAM DATA>

MINimum

MAXimum

UP

DOWN

MARKer

MINimum will set the parameter to be the nearest valid value to negative infinity.

MAXimum will set the parameter to be the nearest valid value to positive infinity.

UP will increase the value by the current step size (set using the :STEP subsystem).

DOWN will decrease the value by the current step size (set using the :STEP subsystem).

MARKer will set the parameter to the current active marker value. Either the domain value or the response will be used depending on the command issued.

An error will be generated if the parameter is meaningless for the particular command.

<STRING PROGRAM DATA>

String program data consists of a number of ASCII characters enclosed in quotes. Either a pair of single ('ASCII 39') or double ("ASCII 34") quotes may be used. If the quote character chosen to mark the beginning and end of the string also appears within it, it must be doubled.

Example:

'This string contains the word "Hello"'

will be interpreted as the string:

This string contains the word 'Hello'

When receiving string data, the 6810A Series GPIB system interprets character codes as follows:

32 - 126	Standard ASCII characters
127	Copyright symbol ©
128	Mu symbol μ
129	Degree symbol °
130	Ohms symbol Ω

Any command received with string data containing any other code will result in an error message being displayed.

<ARBITRARY BLOCK PROGRAM DATA>

This format is used to send large quantities of 8-bit binary data to the instrument.

Since it is not intended that the user should ever need to compile data of this type for transmission to the instrument, details of the format are not given here.

Note that data received from the instrument as <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA> is already in a form suitable for transmission back to the instrument as <ARBITRARY BLOCK PROGRAM DATA>. The definite length form can be used on both GPIB and RS-232 interfaces.

If the indefinite length form is used, the data must be terminated by line feed with EOI asserted. This means that a command requiring <ARBITRARY BLOCK PROGRAM DATA> must be the last <PROGRAM MESSAGE UNIT> of the <PROGRAM MESSAGE>. The indefinite length form of data cannot be used with the RS-232 interface.

<BOOLEAN PROGRAM DATA>

This is not defined in IEEE 488.2, but is a useful addition for programming parameters that have an "ON/OFF" function.

A parameter accepting <BOOLEAN PROGRAM DATA> will take the values OFF | ON | NRf value. If an NRf value is entered it is rounded to an integer, and any value other than zero is treated as ON.

Response data

The following response data functional elements are generated by the instrument:

<CRD> (also known as <CHARACTER RESPONSE DATA>)

<NR1>

<NR2>

<NR3>

<STRING RESPONSE DATA>

<DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

<ARBITRARY ASCII RESPONSE DATA>

<BOOLEAN RESPONSE DATA>

<HEXADECIMAL NUMERIC RESPONSE DATA>

All these functional elements, with the exception of <BOOLEAN RESPONSE DATA>, are defined in IEEE 488.2.

The following informal definitions are provided as a guide:

<CRD>

This type of response is returned when reading the value of a parameter, which can take a number of discrete states. States are represented by short alphanumeric strings.

Note that when setting the parameter, the long form (i.e. INTERNAL, POSITIVE, NEGATIVE or PMETER) may be used, but when the parameter is queried, the short form is always returned.

<NR1>

This type of numeric response is used when returning the value of integer parameters. A negative integer will be preceded with a – sign; a positive integer may or may not have a sign.

Examples:

15
+3
-57

<NR2>

This type of numeric response is used to return real numbers; it includes an explicitly placed decimal point, but no exponent. The decimal point will always be output, with at least one digit before and one digit after the decimal point. A negative number will be preceded with a – sign; a positive number may or may not have a + sign.

Suffixes are not output, and all values will be in the fundamental units (e.g. for frequency the value will always be in Hz, not kHz or MHz, etc.).

Examples:

17.91
-18.27
+18.83

<NR3>

This type of numeric response is used to return real numbers; it includes an explicitly placed decimal point and an exponent. The decimal point will always be output, with at least one digit before and one digit after the decimal point. A negative number will be preceded with a – sign; a positive number may or may not have a + sign. At least one digit will follow the exponent, and the sign of the exponent is always output.

Suffixes are not output, and all values will be in the fundamental units (e.g. for frequency the value will always be in Hz, not kHz or MHz, etc.).

Examples:

1.756E+2
182.8E-3

<STRING RESPONSE DATA>

This takes a similar form to <STRING PROGRAM DATA> except that the delimiting character is always a double quote, ("ASCII 34").

<DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

This form of response is used when reading blocks of 8-bit binary data from the instrument. Examples include settings stores and trace memories.

The format comprises a '#' character followed by a single digit, followed by the data length, followed by the actual data. The single digit indicates how many digits follow to specify the length.

<ARBITRARY ASCII RESPONSE DATA>

This takes the form of an ASCII string terminated by newline (ASCII 10) with EOI asserted.

Notes on interpreting data returned in this format will be found in the descriptions for the few commands that use it.

Because EOI is always used as a terminator, a <QUERY MESSAGE UNIT> which generates data in this form must be the last <QUERY MESSAGE UNIT> in the <PROGRAM MESSAGE>.

<BOOLEAN RESPONSE DATA>

This is not defined in IEEE 488.2, but is a useful addition for querying parameters that have an "ON/OFF" function.

The response is either "0" or "1", where "0" means "OFF" and "1" means "ON".

<HEXADECIMAL NUMERIC RESPONSE DATA>

This type of numeric response is used to return an integer number in hexadecimal notation.

Terminating commands

GPIB

A **<PROGRAM MESSAGE TERMINATOR> (**as defined in IEEE 488.2) can be a line-feed character (ASCII 10), a line-feed character with the ^END message asserted at the same time, or an ^END message asserted with the final character of the <PROGRAM MESSAGE>. The terminator may be preceded by any number of "white space" characters, i.e. any single ACSII-encoded byte in the range 0 to 9 and 11 to 32 decimal.

A **<RESPONSE MESSAGE TERMINATOR> (**as defined in IEEE 488.2) is a line-feed character with the ^END message asserted at the same time.

Many GPIB controllers terminate program messages with a line-feed character and, by default, accept newline as the response message terminator. When transferring binary data - which may contain embedded line-feed characters - it is necessary to ensure that the controller uses only ^END messages. Usually this requires the controller's GPIB interface to be set up to generate and detect ^END. Refer to the documentation supplied with the controller.

RS-232

For RS-232 operation the command is terminated by a line-feed character only.

Command layout

Each command is set out as follows:

1. Path from the subsystem root.

Example:

:SYSTem
:ISETtings
:KEYBoard

2. Parameters

The first line lists each parameter, stating its <PROGRAM DATA> functional element (as defined in IEEE 488.2).

Subsequent lines explain the meaning of each parameter. For numeric parameters, such as those holding frequency or power values, the units are stated (e.g. W, Hz, dB, etc.). For <CPD> (character program data) parameters, the available choices are listed, separated by the "OR" symbol, " | ".

Angle brackets < ... > indicate that the enclosed parameter is described in more detail later in the text.

Example:

Parameters:	<CPD>, <NRf> input id, offset value
Valid values:	input id: [A | B | C | RX] offset value: real

The first line of the parameter definition states that the command takes two parameters. The first parameter is character program data and the second is a numeric value.

The semantic interpretation is given on the second line. The first parameter is the input to which an offset is to be applied; the second parameter is a number representing the offset value.

3. Valid values

Describes the type of number for numeric parameters, e.g. real or integer, and the allowable range, if applicable. If a parameter is defined as character program data, the allowable <CPD> strings are given. For string program data, the maximum number of characters is specified. In the above example, the first parameter can accept the strings A, B, C or RX; the second parameter accepts real numbers.

4. Description

Describes the purpose of the command. Where applicable, a cross-reference to the corresponding local (i.e. front panel) operation in Chapter 3 of this manual is provided. This cross reference is given in the form of a menu title, preceded by the title of the hard key which is used to access that menu; the page number can be easily found by referring to the Chapter 3 contents list.

5. Example.

An example of the use of the command is provided. Examples always use the short form of the command.

6. Query response

Query responses follow the same format as parameter definitions. The first line shows the response in terms of its IEEE 488.2 functional elements, and below it is given the semantics of the response.

Example:

Response:	<NR2> frequency start value
Returned values:	frequency start value: real

Status reporting

The instruments within a GPIB system contain a set of registers that reflect the current state of the instrument and whether a particular event has occurred. It is also sometimes necessary for an instrument to generate an alert if that condition exists or if that event has occurred.

The instrument's status registers contain information about the condition of the instrument. Using these registers it is possible to find out whether an error has occurred with a command, if a setting is out of limits, and other problems or conditions that may make a setting unreliable. These registers can be used either by reading the contents directly when needed, or by configuring them to generate an interrupt signal (SRQ, service request) when the condition(s) of interest occurs. The status system consists of four readable registers:

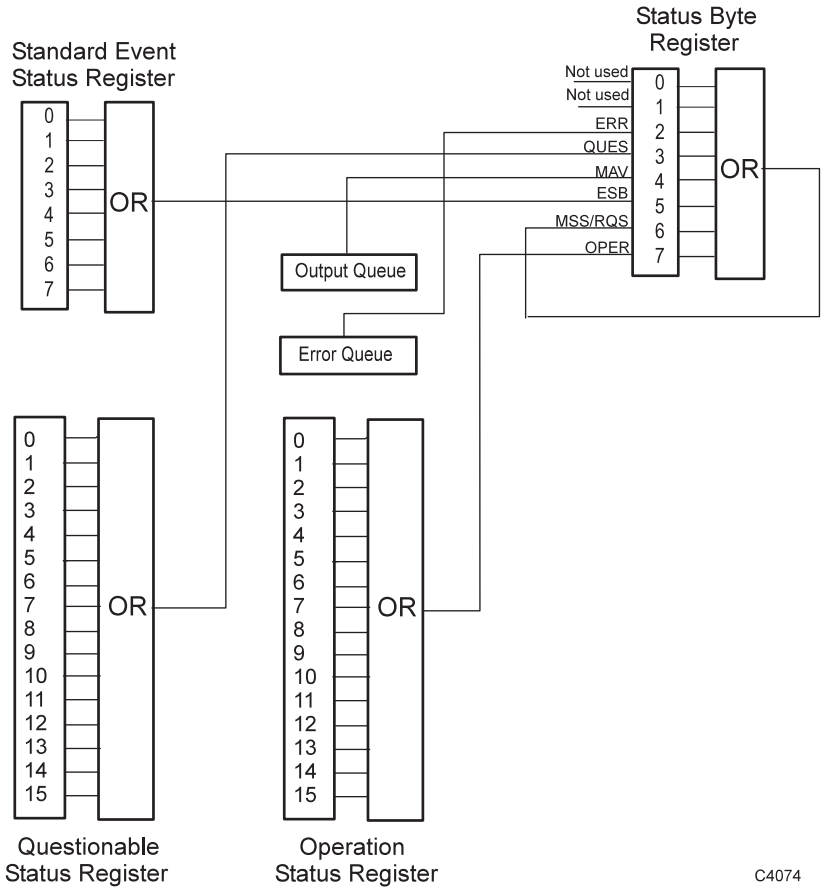

Fig. 4-1 Simplified status register structure

Status Byte Register. This is an 8-bit register that is used to represent particular conditions or events in an instrument. The Status Byte (defined by IEEE 488.1) is read by using the *STB? command or by serial poll. When read by serial poll, an SRQ is generated which interrupts the controller (described later). Associated with the Status Byte Register is the Service Request Enable Register, which allows control over which bits of the status byte contribute towards the generation of the SRQ signal. When read by *STB?, bit 6 of the Status Byte is known as the *master summary status* function (MSS), and is the OR function of the other 7 bits of the register.

Standard Event Status Register. This 8-bit register extends the status reporting structure to cover various other events, defined by IEEE 488.2. The register is read by *ESR? The Standard Event Status Enable Register allows control over which bits of the Standard Event Status Register affect the summary bit output (ESB). The summary bit is recorded in bit 5 of the instrument's Status Byte.

Operation Status Register. This is a 16-bit register, defined in SCPI, which further extends the status reporting structure by providing information about what the instrument is doing. It is read by the STATus:OPERation:CONDition? command. The summary bit output of the register is recorded in bit 7 of the Status Byte.

Questionable Status Register. This is another 16-bit register, also defined in SCPI, which gives information about factors affecting the quality of signal generation. It is read by the STATus:QUEStionable:CONDition? command. The summary bit output of the register is recorded in bit 3 of the Status Byte.

The o*utput queue* temporarily stores responses to query commands received by the instrument until they can be read by the controller. The *error queue* temporarily stores error messages. Each time the instrument detects an error, it places a message in the queue; each item contains an error number, defined in SCPI, and an error message. When the SYSTem:ERRor? query is sent, the message at the head of the error queue is moved to the output queue so it can be read by the controller.

The Operation and Questionable register structures consist of Condition, Event, Transition and Enable registers.

The condition registers continuously monitor the instrument's hardware and firmware status. Bits in a condition register are not latched but are updated in real time, so they represent the actual state of the instrument at all times, and are read by the above commands.

The bits of the event registers (read by STATus:OPERation:EVENt? and STATus:QUEStionable :EVENt?) are set on events. A set of transition filters (Transition Register) control what type of change in a condition register will set the corresponding bit in the event register. The type of transition filter, negative, positive or both, is fixed for each bit. For example, the averaging bits in the Operation register structure have negative transition filters so that the bits in the event register are set when averaging is complete. When the event register bits are set they remain set, even if the corresponding condition bits change. They are reset after being read by the query commands STATus:OPERation:EVENt? and STATus:QUEStionable :EVENt?, or when the *CLS (clear status) common command is issued. Transition registers are read-write, and are unaffected by query commands or *CLS.

The ability of each bit in the event registers to affect the summary bit in the Status Byte Register can be enabled or disabled by corresponding bits in the event enable registers. These can be set and read by the commands/queries STATus:OPERation:ENABle\? and STATus:QUEStionable :ENABle\? The enabled bits are combined in a logical OR operation to produce the summary bit (summary bits are recorded in the instrument's status byte). Enable registers are cleared by *CLS.

The above status reading commands return the decimal number equivalent of the register contents.

The events and conditions that are monitored by the instrument's status registers, and the commands for reading and writing to them, are described in more detail in Appendix C.

As already stated, two techniques are used to interact with the status reporting structure:

Direct-read method. In many cases it is adequate and convenient for the controller simply to read the appropriate registers when necessary to determine the required status information. This technique does not involve the use of SRQ and therefore does not require any interrupt handling code in the application program. The following steps are used to monitor a condition:

1. Determine which register contains the bit that monitors the condition.
2. Send the query command that reads the register.
3. Examine the bit to see if the condition has changed.

The direct-read method works well when it is not necessary to know about changes the moment they occur. A program that uses this method to detect changes in a condition as soon as possible would need to continuously read the registers at very short intervals; the SRQ method is better suited for this type of need.

Service request (SRQ) method. In the SRQ method the instrument plays a more active role, in that it tells the controller when there has been a condition change without the controller asking. The following steps are required to monitor a condition:

1. Determine which register set and which of its bits monitors the condition.

2 Determine how that bit reports to the request service (RQS) bit of the Status Byte (some report directly while others may report indirectly through other register sets).

3. Send remote commands to enable the bit that monitors the condition and to enable the summary bits that report the condition to the RQS bit.

4. Enable the controller to respond to service requests.

When the condition changes, the instrument sets its RQS bit (bit 6) and the GPIB's SRQ line; the controller is informed of the change as soon as it occurs. Setting the SRQ line informs the controller that some device on the bus requires service. The GPIB program then instructs the controller to perform a serial poll; each device on the bus returns the contents of its Statue Byte register in response to this poll. The device whose RQS bit is set to 1 is the device that requested service. After the Status Byte is read the RQS bit is reset to 0; the other bits are not affected.

Another reason for using SRQ is the need to detect errors in the various devices within the instrument. Since the timing of errors may not be known in advance, and it is not practical for the program to check the status of every device frequently, an interrupt handling routine can be used to detect and investigate any SRQ generated.

GETTING STARTED

Introduction

This section provides an introduction to GPIB programming of the 6810A Series.

The remote operation command set

The first point to notice when controlling the 6810A Series remotely is that there is no straightforward mapping between manual front panel operations and their remote command equivalents.

There is no corresponding mechanism for providing "context sensitive" remote commands. Instead, the commands are organized into "subsystems" of related functions, and the number of unique mnemonics required kept to a minimum by the use of compound headers. See *Introduction* on page 4-2 for information about compound headers and other command set conventions.

To help programmers know where to look for a particular command, there follows a brief overview of the command subsystems.

Common commands

A selection of IEEE 488.2 common commands is provided. These all start with a " * " character. The most important of these is *RST, which places the instrument in a defined state. It is good practice to send *RST at the start of any GPIB program.

MMEMory

The MMEMory subsystem is used to:

Provide listings of contents of removable storage
Copy, delete and rename files (internal memory and removable storage)
Format removable storage and create directories
Transfer various types of data to/from the instrument over the GPIB interface

SOURce

The SOURce subsystem contains all commands concerned with the control of the synthesized source, e.g. source mode, sweep range, sweep time, leveling mode and RF on/off. Commands are also provided for user calibration of the source.

STATus

Accesses the SCPI-compatible status reporting structure.

STEP

The STEP subsystem is used to set the amount that is added to or subtracted from a parameter's value when UP or DOWN is selected as a parameter instead of a numeric value. The step value can be set for various parameter types (e.g. frequency, power, time)/

SYSTem

The SYSTem subsystem is used to:

Set up the instrument GPIB address
Set the instrument date / time
Specify Country/Language/Keyboard settings
Specify the serial interface settings
Save / recall instrument settings
Provide service functions
Set the instrument to its default state (preset)

Preparing the 6810A Series for GPIB operation

Connection to the external controller is made via the rear panel GPIB connector. The 6810A Series GPIB system can operate in two modes, controller or talker/listener. In controller mode, the instrument takes control of the bus in order to drive an external source. This mode is selected by pressing the *[No External Controller]* soft key. Talker/listener mode must be selected before the instrument can accept commands from an external controller; in this case this is done by pressing the *[Controlled by GPIB]* soft key.

[UTILITY]
[Remote Control] — This menu allows the GPIB mode and instrument address to be set.

[Controlled by GPIB] — Enables the 6810A Series to be controlled by a GPIB controller.

[GPIB Address] — Specify a new GPIB address, if necessary.

Preparing the 6810A Series for RS-232 operation

Connection to the external controller is made via a 25-way D-type connector on the rear panel of the instrument (pin assignments are given in Chapter 2). For RS-232 operation, make the appropriate selection from the Remote menu. In addition, the interface parameters may need to be set to match the controller, and the type of data flow control specified.

[UTILITY]
[Remote Control]
[Controlled by RS232] — Enables the instrument to be controlled by an RS-232 controller.

[Set Up RS232] — This leads to the Set Up RS232 menu, where the Baud Rate, Parity and type of data flow control can be set, if required.

Flow control can be set to either hardware control or software control. With the former method, dedicated control lines (handshake signals) are used to signify ready or not ready for data. With software control, the control characters XON (start transmitting) and XOFF (stop transmitting) are used; control lines are ignored.

Note that the number of Stop Bits and Data Bits are defaulted when the instrument is being controlled via the RS-232, and cannot be set from this menu.

6810A Series COMMAND SET

Common commands subsystem

***CLS**
***ESE\?**
***ESR?**
***IDN?**
***OPC\?**
***OPT?**
***PCB**
***RST**
***SRE\?**
***STB?**
***TRG**
***TST?**
***WAI**

*CLS

Parameters: none

Description: Clear Status clears the Standard Event Status Register, the Error Queue, the Operation Status Event Register and the Questionable Status Event Register.

Example: `*CLS`

Clear the status reporting structure.

*ESE

Parameters: <NRf>

mask

Valid values: mask: integer. Valid values are 0 to 255. Values outside range are rejected and an error generated.

Description: The Standard Event Status Enable command sets the Standard Event Status Enable Register. This is an eight-bit register.

See Appendix C for details.

Example: `*ESE 2`

Set the Standard Event Status Enable Register to 2 (00000010 in binary). This will allow RQC (Request Control) messages generated by the instrument to be reported in the Event Summary Bit. (RQC is issued by the instrument when it needs to take control of the bus).

*ESE?

Parameters: none

Response: <NR1>

mask

Returned values: mask: integer. Values are in the range 0 to 255.

Description: Read the Standard Event Status Enable Register. This is an eight-bit register.

See Appendix C for details.

Example: `*ESE?`

*ESR?

Parameters: none

Response: <NR1>

register contents

Returned values: register contents: integer. Values are in the range 0 to 255.

Description: Read the value of the Standard Event Status Register. This is an eight-bit register.

See Appendix C for details.

Example: `*ESR?`

*IDN?

Parameters: none

Response: <ARBITRARY ASCII RESPONSE DATA>

Instrument Identification

Returned values: Instrument Identification: string

Description: The Identification Query command allows information about the instrument to be read.

The Instrument Identification is split into four fields:

Manufacturer
Model
Serial number
Software Part No. and Issue No.

Manufacturer returns 'IFR' unless altered to user selected text

Model returns the instrument model number in the form 68xx where:

68xx	Description	Frequency range
6813	Synthesized Generator	20.0 GHz
6815R	Synthesized Generator	40.0 GHz
6815	Synthesized Generator	46.0 GHz

Serial number is in the form ssssss/sss where s is an ASCII digit in the range 0 to 9.

Software Part No. and Issue No. is in the form ppppp/ppp/ii.ii where p and i are ASCII digits in the range 0 to 9.

Example: `*IDN?`

Read information on the instrument.

Example response: IFR,6813,123456/123,44540/026/03.00

*OPC

Parameters: none

Description: The Operation Complete command sets the Operation Complete bit in the Standard Event Status Register when execution of all overlapped commands have completed.

This command is really only useful after an overlapped command when it will indicate when that command has been completed. Other (non-overlapped) commands can be executed whilst the overlapped command is still being executed. If there is more than one overlapped command being executed, the Operation Complete bit will only be set once all of the overlapped commands complete.

*OPC should be the final <PROGRAM MESSAGE UNIT> of the <PROGRAM MESSAGE>.

See Appendix F for a list of overlapped commands.

Example:
```
:HARD:PLOT; *OPC
```

Initiate a plot of the currently displayed settings. The Operation Complete bit will be set in the Standard Event Status Register when the instrument has finished printing.

*OPC?

Parameters: none

Response: <NR1>

operation complete

Returned values: operation complete: integer. Value is 1

Description: The Operation Complete Query returns a '1' when all overlapped commands have completed.

This command is really only useful after an overlapped command when it will indicate when that command has been completed.

*OPC? should be the final <QUERY MESSAGE UNIT> of the <PROGRAM MESSAGE>.

See Appendix F for a list of overlapped commands.

Example:
```
:HARD:BUIL; *OPC?
```

Initiate a print of the instrument's build state. When the instrument has finished printing, the value '1' will be placed in the output queue.

*OPT?

Parameters: none

Response: <ARBITRARY ASCII RESPONSE DATA>

options

Returned values: options: string

Description: Read hardware options present. If no options are present a single "0" is returned otherwise the response is a number of strings separated by commas. If the option is present it will return the string shown below, if it is not present nothing is returned for that option.

String	Meaning
MON	Monochrome display (color is standard)
70DB	70 dB Attenuator (20 GHz)
90DB	90 dB Attenuator (24 GHz)
70DB46G	70 dB Attenuator (46 GHz)
FCON	Field replaceable connectors
FM	Source Frequency Modulation
EFM	Source FM (external modulation only)

Note that :SYST:OPT? can be used instead if a bit-field is easier to work with than this string format.

The options FM and EFM are mutually exclusive. If the option is present to generate internal FM then 'FM' will be reported otherwise 'EFM' will be reported, indicating that FM is available using an external modulating input.

Example: `*OPT?`

Example response: 90DB

*PCB

Parameters: <NRf>[,<NRf>]

controller address[,secondary address]

Valid values: controller address: integer. Valid values are 0 to 30. Values outside range are rejected and an error generated.

secondary address: integer. Valid values are 0 to 30. Values outside range are rejected and an error generated.

Description: Any hard copy output, when being controlled over GPIB and the hard copy device is on the GPIB, requires the instrument to act temporarily as the GPIB controller. *PCB is used to tell the instrument the address of the System Controller so that control can be passed back to it on completion of the command. This command will generate an error if received over the serial interface.

Example: `*PCB 21`

Inform the instrument that the system controller's GPIB address is 21.

*RST

Parameters: none

Description: Reset the instrument. This command places the instrument in its default state. See Appendix E for details on which parameters are not affected by preset.

If the Remote control system fails to respond to *RST, it may be cleared by sending a DEVICE CLEAR command. It is good practice to precede *RST with DEVICE CLEAR.

Note that *RST is not identical to :SYST:PRES.

Example: `*RST`

Reset instrument to known state.

*SRE

Parameters: <NRf>

mask

Valid values: mask: integer. Valid values are 0 to 255. Values outside range are rejected and an error generated.

Description: Set the Service Request Enable Register. This is an eight-bit register.

See Appendix C for details.

Example: `*SRE 32`

Set the Service Request Enable Register to 32 (0010 0000 in binary) to enable service requests when the Standard Event Status Register Summary Bit is set.

*SRE?

Parameters: none

Response: <NR1>

mask

Returned values: mask: integer. Values are in the range 0 to 255.

Description: Read the Service Request Enable Register. This is an eight-bit register.

See Appendix C for details.

Example: `*SRE?`

*STB?

Parameters: none

Response: <NR1>

status byte

Returned values: status byte: integer. Values are in the range 0 to 255.

Description: Read the Status Byte Register. This is an eight-bit register. Bit 6 of the register contains the Master Summary Status.

See Appendix C for details.

Example:
```
*STB?
```

*TRG

Parameters: none

Description: Trigger command. This command is equivalent to Group Execute Trigger.

Example:
```
:SYST:TRIG MEAS; *TRG
```

Place instrument into Trigger mode.

*TST?

Parameters: none

Response: <NR1>

self test completed

Returned values: Self-test completed: integer. Values are in the range 0 to 1.

Description: Self-Test Query. This performs a self-test (identical to the power on test) and returns a value of 0 if the test passes and 1 if it fails.

If the test fails, use the :SYST:TEST:... commands to read the test results.

Example:
```
*TST?
```

Perform a self-test.

*WAI

Parameters: none

Description: The Wait to Continue command inhibits execution of a command until the execution of all overlapped commands has been completed.

This command is really only useful after an overlapped command when it will hold off further commands until that command has been completed. If there is more than one overlapped command being executed, the next command will be held off until all of the overlapped commands complete.

See Appendix F for a list of overlapped commands.

DISPlay subsystem

DISPlay
- **BLIGht\?**
- **CONTrast\?**
- **CPALette\?**

:DISPlay

:BLIGht

Parameters: <CPD>

backlight brightness

Valid values: backlight brightness: [OFF | MINimum | LOW | HIGH | MAXimum]. Values other than those stated are rejected and an error generated.

Description: Set the backlight brightness.

When using the instrument outside, the backlight on the monochrome LCD is not required and can be turned off by using :DISP:BLIG OFF. When using inside, the backlight should be turned on and set as appropriate to the ambient lighting conditions.

The backlight cannot be turned off on an instrument with a color LCD. Selecting OFF will give an error.

Example: `:DISP:BLIG MAX`

Set the display backlight to Full Brightness.

:DISPlay

:BLIGht?

Parameters: none

Response: <CRD>

backlight brightness

Returned values: backlight brightness: [OFF | MIN | LOW | HIGH | MAX]

Description: Read the backlight brightness.

Example: `:DISP:BLIG?`

:DISPlay

:CONTrast

Parameters: <NUMERIC VALUE>

contrast

Valid values: contrast: integer. Valid values are 0 to 100. Values outside range are clipped.

Suffix: contrast: A suffix of pct is accepted for a value of percent. If no suffix is entered then the default suffix of pct is assumed.

Description: Set the contrast between 0% and 100%. This will affect the viewing angle of the display.

This command will not be accepted on instruments with a color display.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:DISP:CONT 50`

Set display contrast to 50%.

:DISPlay

:CONTrast?

Parameters: none

Response: <NR1>

contrast

Returned values: contrast: integer. Values are in the range 1 to 100.

Description: Read the display contrast.

This command will not be accepted on instruments with a color display.

Example: `:DISP:CONT?`

:DISPlay

:CPALette

Parameters: <CPD>

palette

Valid values: palette : [COLour | WHITe | BLACk | GREen | MONochrome]. Values other than those stated are rejected and an error generated.

Description: Set the color palette on an instrument equipped with the color LCD. This command will generate an error if it is received on an instrument fitted with the monochrome LCD. Use *OPT? or :SYST:OPT? to determine which LCD is fitted.

COLour gives a normal color display
WHITe gives white on black display
BLACk gives black on white display
GREen gives green on black display
MONochrome gives a greyscale display

Example: `:DISP:CPAL GRE`

Select green on black display

:DISPlay

:CPALette?

Parameters: none

Response: <CRD>

palette

Returned values: palette : [COL | WHIT | BLAC | GRE | MON]

Description: Determine the color palette in use on an instrument equipped with the color LCD. This command will generate an error if it is received on an instrument fitted with the monochrome LCD. Use *OPT? or :SYST:OPT? to determine which LCD is fitted.

Example: `:DISP:CPAL?`

MMEMory subsystem

- **MMEMory**
  - **ATTRibutes?**
  - **CATalog**
    - **COUNt?**
    - **[FILes]?**
    - **SIZes?**
  - **CDIRectory\?**
  - **COPY**
  - **DELete**
  - **ERASe**
    - **[ALL]**
  - **ID\?**
  - **MDIRectory**
  - **MSIS\?**
  - **RDIRectory**
  - **READ**
    - **HSETup?**
    - **SETTings?**
    - **SOURce**
      - **FCALibration?**
      - **FM?**
      - **FSTandard?**
      - **PPOWer?**
      - **UPOWer?**
  - **REName**
  - **WRITe**
    - **HSETup**
    - **SETTings**
    - **SOURce**
      - **FCALibration**
      - **FM**
      - **FSTandard**
      - **PPOWer**
      - **UPOWer**

:MMEMory

:ATTRibutes?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

attributes

Returned values: attributes: integer

Description: Return the attributes of the specified file. Both file name and extension must be given to ensure one and only one file will be accessed.

The returned value is encoded as follows:

Bit	Meaning
0	Store contains default data
1	Store is password protected
2	Read-only file
3	Archive
4	System
5	Hidden

The file will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: *:MMEM:MSIS "A"; CDIR*

:MMEMory

:CATalog?

:COUNt?

Parameters: <STRING PROGRAM DATA>

file type

Valid values: file type: string. Maximum length of 3 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

total files

Returned values: total files: integer

Description: Return a count of files of the type specified (or all, if the parameter is an asterisks "*"). To list directories, use "dir" as the file type.

The files will be accessed using the file type sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

The following extensions will be used to specify store types:

LNG	Foreign language support files
PCS	User Power Calibration Stores
SET	Settings stores

Example:

```
:MMEM:MSIS "A"; CAT:COUN? "SET"
```

Determine how many settings stores are in the current directory on the removable storage.

:MMEMory

:CATalog

[:FILes]?

Parameters: <STRING PROGRAM DATA>

file type

Valid values: file type: string. Maximum length of 3 characters excluding quotes. Excess characters will be ignored.

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first file name, ..., last file name

Returned values: first file name: string
...
last file name: string

Description: Return a list of files of the type specified (or all, if the parameter is an asterisks "*"). To list directories, use "dir" as the file type.

The files will be accessed using the file type sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select instrument memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

The following extensions will be used to specify store types:

LNG	Foreign language support file
PCS	User Power Calibration Stores
SET	Settings stores

Example: `:MMEM:MSIS "A"; CAT? "SET"`

Get a catalogue of all the settings stores in the current directory on the removable storage.

Example response: "

:MMEMory

:CATalog

:SIZes?

Parameters: <STRING PROGRAM DATA>

file type

Valid values: file type: string. Maximum length of 3 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>, ..., <NR1>

first file length, ..., last file length

Returned values: first file length: integer
...
last file length: integer

Description: Return a list of sizes of files of the type specified (or all, if the parameter is an asterisks "*"). To list directories, use "dir" as the file type.

The files will be accessed using the file type sent as part of this command together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select instrument memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

The following extensions will be used to specify store types:

LNG	Foreign language support file
PCS	User Power Calibration Stores
SET	Settings stores

Example: `:MMEM:MSIS "A"; CAT:COUN? "SET"; SIZ? "SET"`

Get a catalogue of all the sizes of setting stores in the current directory on the removable storage.

Example response: 3; 9754, 9754, 9754

:MMEMory
:CDIRectory

Parameters: <STRING PROGRAM DATA>

directory path

Valid values: directory path: string. Maximum length of 144 characters excluding quotes. Excess characters will be ignored.

Description: Change the current directory. This only applies to the removable storage. A null directory path will generate an error.

Example:
```
:MMEM:CDIR "\my_mems\source"
```

Set the current directory to be \my_mems\source.

:MMEMory
:CDIRectory?

Parameters: none

Response: <STRING RESPONSE DATA>

directory path

Returned values: directory path: string

Description: Determine the current directory. This will always be returned as a full path name from root.

Example:
```
:MMEM:CDIR?
```

:MMEMory
:COPY

Parameters: <STRING PROGRAM DATA>, <STRING PROGRAM DATA>

file name source, file name destination

Valid values: file name source: string. Maximum length of 144 characters excluding quotes. Excess characters will be ignored.
file name destination: string. Maximum length of 144 characters excluding quotes. Excess characters will be ignored.

Description: Copy a file to another file. The file may be copied to and from the same device (removable storage only) or across devices.

The file name must be a full pathname (except when accessing internal storage) and include the msus to specify one and only one file. Not all files can be accessed on the internal storage - only 'standard' files, e.g. trace memories, path cals, etc, can be copied. A path name must not be given for internal storage.

Use C: or A: to specify internal memory or removable storage.

Example:
```
:MMEM:COPY "A:\MY_MEMS\SOURCE\FLAT_MEM.SET",
"C:FLAT_MEM.SET"
```

Copy settings memory from removable storage to internal memory.

:MMEMory

:DELete

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Description: Delete the specified file in the current directory. File name and extension must be given.

The file will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "A"; CDIR "\SETTINGS"; DEL "MAX.SET"`

Delete MAX.SET *in* \SETTINGS *on the removable storage.*

:MMEMory

:ERASe

[:ALL]

Parameters: none

Description: Erase all stores. The following internal stores are cleared:

All settings stores

Example: `:MMEM:ERAS`

Erase most of the stores in the instrument.

:MMEMory

:ID

Parameters: <STRING PROGRAM DATA>, <STRING PROGRAM DATA>

file name, user id

Valid values: file name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

user id: string

Description: Set the id string of the specified file in the current directory. The id string gives additional details of the file over what can be determined from the file name and extension alone. For most files the id string is user entered - allowing a more meaningful description than that allowed by the DOS filename.

Both file name and extension must be given to ensure one and only one file will be accessed.

The file will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example:
```
:MMEM:MSIS "A"; CDIR "\SETTINGS"; ID "MAXPK.SET",
"Johns"
```

Set the user entered id string from MAXPK.SET *in* \SETTINGS *on the removable storage.*

:MMEMory :ID?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Response: <STRING RESPONSE DATA>

id string

Returned values: id string: string

Description: Read the id string of the specified file in the current directory. The id string gives additional details of the file over what can be determined from the file name and extension alone. For most files the id string is user entered - allowing a more meaningful description than that allowed by the DOS filename. For fixed files, the id string will give information appropriate to the file type, for example with hardcopy devices (.DRV files) the id string will give the name of the printer(s) that the driver supports.

Both file name and extension must be given to ensure one and only one file will be accessed.

The file will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "A"; CDIR "\SETTINGS"; ID? "MAXPK.SET"`

Read the user entered id string from MAXPK.SET *in* \SETTINGS *on the removable storage.*

:MMEMory :MDIRectory

Parameters: <STRING PROGRAM DATA>

directory name

Valid values: directory name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Description: Create a new directory as a subdirectory of the current directory. This only applies to the removable storage.

Use :MMEM:CDIR to select the directory to create the new directory in.

Example: `:MMEM:MDIR "setup1"`

Create a new directory called setpu1 *as a subdirectory of the current directory.*

:MMEMory :MSIS

Parameters: <STRING PROGRAM DATA>

storage device

Valid values: storage device: string. Maximum length of 1 character excluding quotes. Excess characters will be ignored.

Description: Change the currently selected mass storage device.

The storage device is defined as:

A	Removable storage.
C	The internal memory.

Example: `:MMEM:MSIS "A"`

Set the selected mass storage device to be removable storage.

:MMEMory :MSIS?

Parameters: none

Response: <STRING RESPONSE DATA>

storage device

Returned values: storage device: string. Maximum length of 1 character excluding quotes.

Description: Determine the currently selected mass storage device.

The storage device is defined as:

A	Removable storage.
C	The internal memory.

Example: `:MMEM:MSIS?`

:MMEMory :RDIRectory

Parameters: <STRING PROGRAM DATA>

directory name

Valid values: directory name: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Description: Delete the specified directory, which must be a subdirectory of the current directory and must be empty. This only applies to the removable storage.

Use :MMEM:CDIR to select the parent directory of the directory you wish to remove.

Example: `:MMEM:RDIR "setup1"`

Delete a directory called setup1 *that is a subdirectory of the current directory.*

:MMEMory

:READ

:HSETup?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

hardcopy setup store contents

Description: Read hardcopy setup data from a hardcopy setup store and output over remote interface. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "A"; READ:HSET? "LAYOUT"`

Read hardcopy setup data from store LAYOUT *on the removable storage.*

:MMEMory

:READ

:SETTings?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

settings store contents

Description: Read instrument settings data from a settings store and output over remote interface. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "A"; READ:SETT? "LIST2"`

Read settings data from store LIST2 *on the removable storage.*

:MMEMory
:READ
:SOURce
:FCALibration?

Parameters: none

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

store contents

Description: Read the source frequency calibration store data.

Example: `:MMEM:READ:SOUR:FCAL?`

:MMEMory
:READ
:SOURce
:FM?

Parameters: none

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

store contents

Description: Read the source fm calibration store data. This command will generate an error if the FM option is not present.

Example: `:MMEM:READ:SOUR:FM?`

:MMEMory
:READ
:SOURce
:FSTandard?

Parameters: none

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

store contents

Description: Read the source frequency standard calibration store data.

Example: `:MMEM:READ:SOUR:FST?`

:MMEMory

:READ

:SOURce

:PPOWer?

Parameters: none

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

Description: Read the source primary power calibration store data.

Example: `:MMEM:READ:SOUR:PPOW?`

:MMEMory

:READ

:SOURce

:UPOWer?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

store contents

Description: Read data from user source power calibration store.

Example: `:MMEM:READ:SOUR:UPOW? "USR2"`

Read power calibration data from user source power calibration store USR2.

:MMEMory

:REName

Parameters: <STRING PROGRAM DATA>, <STRING PROGRAM DATA>

file name old, file name new

Valid values: file name old: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.
file name new: string. Maximum length of 12 characters excluding quotes. Excess characters will be ignored.

Description: Rename a file. The full filename including the extension must be specified for the old name and the new name. It is not recommended that the extension is changed since the instrument uses the extension to determine the type of file being accessed.

The files will be accessed using the file names sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if the file to be renamed is on the removable storage).

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:REN "FLAT_MEM.SET", "NEW_MEM.SET"`

Rename a settings memory file from FLAT_MEM *to* NEW_MEM.

:MMEMory

:WRITe

:HSETup

Parameters: <STRING PROGRAM DATA>,<ARBITRARY BLOCK PROGRAM DATA>

file name, hardcopy setup store data

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Write hardcopy setup data to a hardcopy setup store. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if saving to the removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "C"; WRIT:LIM "FOR_HP",#...etc`

Write hardcopy setup data to store FOR_HP *in the instrument. (Only the first character of the hardcopy setup data is shown).*

:MMEMory
:WRITe
:SETTings

Parameters: <STRING PROGRAM DATA>,<ARBITRARY BLOCK PROGRAM DATA>

file name, settings store contents

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Write instrument settings data to a settings store. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if saving to the removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select internal memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

Example: `:MMEM:MSIS "A"; WRIT:SETT "LIST2",#...etc`

Write instrument settings data to store LIST2 *on the removable storage. (Only the first character of the memory data is shown).*

:MMEMory
:WRITe
:SOURce
:FCALibration

Parameters: <ARBITRARY BLOCK PROGRAM DATA>

store contents

Description: Send data to source frequency calibration store.

Example: `:MMEM:WRIT:SOUR:FCAL #...etc`

Send source frequency calibration data to source frequency store. (Only first byte of data shown).

:MMEMory
:WRITe
:SOURce
:FM

Parameters: <ARBITRARY BLOCK PROGRAM DATA>

store contents

Description: Send data to source FM calibration store. This command will give an error if the FM option is not fitted.

Example: `:MMEM:WRIT:SOUR:FM #...etc`

Send source FM calibration data to source fm store. (Only first byte of data shown).

:MMEMory
:WRITe
:SOURce
:FSTandard

Parameters: <ARBITRARY BLOCK PROGRAM DATA>

store contents

Description: Send data to source frequency standard calibration store.

Example: `:MMEM:WRIT:SOUR:FST #...etc`

Send source frequency calibration data to source frequency store. (Only first byte of data shown).

:MMEMory
:WRITe
:SOURce
:PPOWer

Parameters: <ARBITRARY BLOCK PROGRAM DATA>

store contents

Description: Write the source primary power calibration store data.

Example: `:MMEM:WRIT:SOUR:PPOW #...etc`

:MMEMory

:WRITe

:SOURce

:UPOWer

Parameters: <STRING PROGRAM DATA>,<ARBITRARY BLOCK PROGRAM DATA>

file name, store contents

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Send data to user source power calibration store.

Example: `:MMEM:WRIT:SOUR:UPOW "CAL1", #...etc`

Send source power calibration data to user source power calibration store CAL1. *(Only first byte of data shown).*

SOURce subsystem

```
SOURce
        BLANking\?
        CALibration
                FM
                FREQuency
                POWer
                        [BBANd]
                        NBANd
                SELect\?
                STANdard
                TRANsfer
        DOMain
                [ASCii]?
                BINary?
        FM
                [DEViation]\?
                EXTernal
                        COUPling\?
                        DCNull
                INTernal
                        FREQuency\?
                SOURce\?
                STATe\?
        FREQuency
                CENTer\?
                CENTre\?
                [CW]\?
                SPAN\?
                STANdard\?
                STARt\?
                STOP\?
        LEVelling\?
        LIST
                [APPend]
                CLEar
                CSWeep
                LOAD
                PDELay
                        AUTO\?
                        TIME\?
                READ?
                RESet
                REVerse\?
                SAVE
                STEP
                TRIGger\?
        MODE\?
        POWer
                LEVel\?
                STARt\?
                STOP\?
```

RF\?
SBANdwidth
MICRowave\?
MODE\?
RF\?
SWEep
AUTO\?
POINts\?
TIME\?
VOUTput
MODE\?
VALue\?

:SOURce
:BLANking

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Set source RF blanking on or off.

Example: `:SOUR:BLAN ON`

Set source RF blanking on.

:SOURce
:BLANking?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Determine whether source RF blanking is on or off.

Example: `:SOUR:BLAN?`

:SOURce
:CALibration
:FM

Parameters: none

Description: Perform a source FM calibration and save data to source FM calibration store. The data is used immediately by the instrument. Any previous FM calibration data is lost.

Example: `:SOUR:CAL:FM`

:SOURce
:CALibration
:FREQuency

Parameters: none

Description: Perform a source frequency calibration and save data to source frequency calibration store. The data is used immediately by the instrument. Any previous frequency calibration data is lost.

Example: `:SOUR:CAL:FREQ`

:SOURce

:CALibration

:POWer

[:BBANd]

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Perform a broadband source power calibration and save data to specified user source power calibration store. The store will be accessed using the file name sent as part of this command. A file extension should not be specified as this is fixed by the instrument. Source power calibrations cannot be saved to the removable storage.

The user store can then be selected or the data can be transferred to the primary power calibration store.

If the user source power calibration store being saved to is the one currently in use then the data will be used immediately, otherwise it will only be used when the store is selected, or, if the primary power cal is in use, when the user store is transferred to the primary power cal.

Example: `:SOUR:CAL:POW "MY_CAL"`

Perform a broad band source power cal and save to user power calibration store MY_CAL.

:SOURce
:CALibration
:POWer
:NBANd

Parameters: <NUMERIC VALUE>, <NUMERIC VALUE>, <STRING PROGRAM DATA>

start frequency, stop frequency, file name

Valid values: start frequency: real
stop frequency: real
file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Suffix: start frequency: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

stop frequency: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: Perform a narrow band source power calibration and save data to specified user source power calibration store. The store will be accessed using the file name sent as part of this command. A file extension should not be specified as this is fixed by the instrument. Source power calibrations cannot be saved to the removable storage.

The user store can then be selected or the data can be transferred to the primary power calibration store.

If the user source power calibration store being saved to is the one currently in use then the data will be used immediately, otherwise it will only be used when the store is selected, or, if the primary power cal is in use, when the user store is transferred to the primary power cal.

Example: `:SOUR:CAL:POW:NBAN 2GHZ, 5.5GHZ, "MY_CAL"`

Perform a narrow band source power cal and save to user power calibration store MY_CAL.

:SOURce
:CALibration
:SELect

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Select a source power calibration. If the filename specified is PRIMPWR then the primary power calibration will be selected otherwise the specified user power calibration will be selected.

Example: `:SOUR:CAL:SEL "MY_CAL"`

Select user source power calibration MY_CAL.

:SOURce
:CALibration
:SELect?

Parameters: none

Response: <STRING RESPONSE DATA>

calibration file name

Returned values: calibration file name: string

Description: Determine which power calibration is in use. If the primary power calibration is selected, this command will return PRIMPWR, otherwise the name of the selected user power calibration is returned.

Example: `:SOUR:CAL:SEL?`

:SOURce
:CALibration
:STANdard

Parameters: none

Description: Perform a source frequency standard calibration and save data to source frequency standard calibration store. The data is used immediately by the instrument. Any previous frequency standard calibration data is lost.

Example: `:SOUR:CAL:STAN`

:SOURce
:CALibration
:TRANsfer

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Transfer a user source power calibration to the primary power calibration.

Example: `:SOUR:CAL:TRAN "FULL"`

Transfer user source power cal FULL *to the primary source power calibration.*

:SOURce
:DOMain
[:ASCii]?

Parameters: none

Response: <NR3>, ..., <NR3>

domain at point 0, ..., domain at point *n*-1

Returned values: domain at point 0: real
...
domain at point *n*-1: real

Description: Read the domain values for every source point. Note that these are measured points not display points.

Example: `:SOUR:DOM?`

:SOURce

:DOMain

:BINary?

Parameters: none

Response: <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>

domain data

Description: Read the domain values for every source point.

The returned data is organized as follows:

Each domain value consists of 8 bytes received in the order:
byte 0 : S E E E E E E E
byte 1 : E E E E F F F F
byte 2 : F F F F F F F F
byte 3 : F F F F F F F F
byte 4 : F F F F F F F F
byte 5 : F F F F F F F F
byte 6 : F F F F F F F F
byte 7 : F F F F F F F F
Where S is sign bit, E is exponent (11 bits), and F is fractional part (52 bits).

These bytes hold a 64-bit (IEEE single precision) number conforming to the IEEE Standard of Binary Floating-Point Arithmetic, ANSI/IEEE Std 754-1985.

Example: `:SOUR:DOM:BIN?`

:SOURce

:FM

[:DEViation]

Parameters: <NUMERIC VALUE>

FM deviation value

Valid values: FM deviation value real

Suffix: FM deviation value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the source FM deviation value. This command is invalid if the domain is not frequency.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM 1E6`

Set the FM deviation to 1 MHz.

:SOURce

:FM

[:DEViation]?

Parameters: none

Response: <NR2>

FM deviation value

Returned values: FM deviation value: real

Description: Determine the source FM deviation value.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM?`

:SOURce
:FM
:EXTernal
:COUPling

Parameters: <CPD>

external coupling

Valid values: external coupling: [AC | DC]. Values other than those stated are rejected and an error generated.

Description: Select whether the external FM signal is AC or DC coupled.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM:EXT:COUP AC`

Select AC coupling of the FM signal.

:SOURce
:FM
:EXTernal
:COUPling?

Parameters: none

Response: <CRD>

external coupling

Returned values: external coupling: [AC | DC]

Description: Determine whether DC or AC coupling is selected.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM:EXT:COUP?`

:SOURce
:FM
:EXTernal
:DCNull

Parameters: none

Description: Perform a DC null operation. The FM source should be external DC.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM:EXT:DCN`

Perform a DC Null. External DC FM must be selected.

:SOURce
:FM
:INTernal
:FREQuency

Parameters: <NUMERIC VALUE>

internal frequency value

Valid values: internal frequency value: real

Suffix: internal frequency value: The following suffixes are accepted for frequency: Hz, kHz and MHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the internal modulation frequency to be used for CW FM. For the value to be used the internal mod generator must be selected using SOUR:FM:SOUR INT.

This command is only valid if the group delay option is present.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FM:INT:FREQ 200E3`

Set the internal mod frequency to 200 kHz.

:SOURce
:FM
:INTernal
:FREQuency?

Parameters: none

Response: <NR2>

internal frequency value

Returned values: internal frequency value: real

Description: Determine the internal mod frequency value. This command is only valid if the group delay option is fitted.

Example: `:SOUR:FM:INT:FREQ?`

:SOURce

:FM

:SOURce

Parameters: <CPD>

coupling mode

Valid values: coupling mode: [INTernal | EXTernal]. Values other than those stated are rejected and an error generated.

Description: Select whether the internal modulator or an external frequency source is being used to generate FM. When selecting external, external AC will be selected. To change to external DC use the SOUR:FM:EXT:COUP DC command.

This command is only valid if the group delay option is fitted to the instrument.

Example: `:SOUR:FM:SOUR EXT`

Select external (AC) modulation source for generation of the FM signal.

:SOURce

:FM

:SOURce?

Parameters: none

Response: <CRD>

coupling mode

Returned values: coupling mode: [INT | EXT]

Description: Determine whether internal or external modulation is selected. This command is only valid if the group delay option is fitted to the instrument.

Example: `:SOUR:FM:SOUR?`

:SOURce

:FM

:STATe

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Set FM on or off.

This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM:STAT ON`

Set FM on.

:SOURce

:FM

:STATe?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Determine whether FM is on. This command is only valid if the FM option is fitted to the instrument.

Example: `:SOUR:FM:STAT?`

:SOURce
:FREQuency
:CENTer

Parameters: <NUMERIC VALUE>

frequency center value

Valid values: frequency center value: real

Suffix: frequency center value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the source frequency center value. This command is invalid if the domain is not frequency.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:CENT 15E9`

Set the center frequency to 15 GHz.

:SOURce
:FREQuency
:CENTer?

Parameters: none

Response: <NR2>

frequency center value

Returned values: frequency center value: real

Description: Determine the source frequency center value. Note that this command is invalid if the instrument is set up such that the user cannot set the center value.

Example: `:SOUR:FREQ:CENT?`

:SOURce

:FREQuency

:CENTre

Parameters: <NUMERIC VALUE>

frequency center value

Valid values: frequency center value: real

Suffix: frequency center value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the source frequency center value. This command is identical to :DISP:CENT. This command is invalid if the domain is not frequency.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:CENT 15E9`

Set the center frequency to 15 GHz.

:SOURce

:FREQuency

:CENTre?

Parameters: none

Response: <NR2>

frequency center value

Returned values: frequency center value: real

Description: Determine the source frequency center value. Note that this command is invalid if the instrument is set up such that the user cannot set the center value.

Example: `:SOUR:FREQ:CENT?`

:SOURce

:FREQuency

:CW

Parameters: <NUMERIC VALUE>

CW frequency

Valid values: CW frequency: real

Suffix: CW frequency: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the CW frequency. This value is only used when the source is set to CW mode or a power sweep using :SOUR:MODE.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:CW 15E9`

Set the CW frequency to 15 GHz.

:SOURce

:FREQuency

:CW?

Parameters: none

Response: <NR2>

CW frequency

Returned values: CW frequency: real

Description: Determine the CW frequency.

Example: `:SOUR:FREQ:CW?`

:SOURce
:FREQuency
:SPAN

Parameters: <NUMERIC VALUE>

frequency span value

Valid values: frequency span value: real

Suffix: frequency span value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the frequency span (the :SOUR:MODE command is used to specify the domain as frequency).

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:SPAN 10E9`

Set the frequency span to 10 GHz (assuming the domain is frequency).

:SOURce
:FREQuency
:SPAN?

Parameters: none

Response: <NR2>

span value

Returned values: span value: real

Description: Determine the source frequency span.

Example: `:SOUR:FREQ:SPAN?`

:SOURce

:FREQuency

:STANdard

Parameters: <CPD>

frequency standard

Valid values: frequency standard: [INT | EX1 | EX10]. Values other than those stated are rejected and an error generated.

Description: Select a source frequency standard: internal, external 1 MHz or external 10 MHz.

Example: `:SOUR:FREQ:STAN EX1`

Select the rear panel FREQ STD INPUT/OUTPUT to accept a 1 MHz external frequency standard.

:SOURce

:FREQuency

:STANdard?

Parameters: none

Response: <CRD>

frequency standard

Returned values: frequency standard: [INT | EX1 | EX10]

Description: Determine the source frequency standard in use.

Example: `:SOUR:FREQ:STAN?`

:SOURce
:FREQuency
:STARt

Parameters: <NUMERIC VALUE>

frequency start value

Valid values: frequency start value: real

Suffix: frequency start value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the source frequency start value (the :SOUR:MODE command is used to specify the domain).

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:STAR 10.0E9`

Set the start frequency to 10 GHz.

:SOURce
:FREQuency
:STARt?

Parameters: none

Response: <NR2>

frequency start value

Returned values: frequency start value: real

Description: Determine the source frequency start value.

Example: `:SOUR:FREQ:STAR?`

:SOURce
:FREQuency
:STOP

Parameters: <NUMERIC VALUE>

frequency stop value

Valid values: frequency stop value: real

Suffix: frequency stop value: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: This sets the source frequency stop value (the :SOUR:MODE command is used to specify the domain).

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:FREQ:STOP 16.5E9`

Set the stop frequency to 16.5 GHz (assuming the domain is frequency).

:SOURce
:FREQuency
:STOP?

Parameters: none

Response: <NR2>

frequency stop value

Returned values: frequency stop value: real

Description: Determine the source frequency stop value

Example: `:SOUR:FREQ:STOP?`

:SOURce
:LEVelling

Parameters: <CPD>

leveling mode

Valid values: leveling mode: [INTernal | POSitive | NEGative | PMETer]. Values other than those stated are rejected and an error generated.

Description: Set the source leveling mode:

INTernal	Internal leveling
POSitive	External leveling - using a +ve polarity detector
NEGative	External leveling - using a -ve polarity detector
PMETer	External leveling - using a power meter

Example: `:SOUR:LEV PMET`

Enable power meter leveling.

:SOURce
:LEVelling?

Parameters: none

Response: <CRD>

leveling mode

Returned values: leveling mode: [INT | POS | NEG | PMET]

Description: Determine the source leveling mode.

Example: `:SOUR:LEV?`

:SOURce
:LIST
[:APPend]

Parameters: <NUMERIC VALUE>

frequency

Valid values: Frequency: real

Suffix: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed. This command is only valid on variants that support list sweep. Note that this command operates on a copy of the list in working memory. Appended frequencies are not output until the list is saved using the SAVE command.

Description: Append the frequency to the list. If the list is full, the last point in the list is overwritten.

Example: `:SOUR:LIST 2.3GHz`

:SOURce
:LIST
:CLEar

Parameters: none

Description: Clears the list.

Subsequent :SOUR:LIST:APP commands will build a new list starting with point 0. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:CLE`

:SOURce
:LIST
:CSWeep

Parameters: none

Description: Replaces the existing list with a list calculated from the current start, stop and number of points parameters used to define a linear frequency sweep. (The purpose of this command is to create a list that resembles a conventional linear frequency sweep, but allows fast point-by-point triggering.)

Example: `:SOUR:LIST:CSW`

:SOURce
:LIST
:LOAD

Parameters: none

Description: 'Load' existing list ready for modification using CLEar or APPend.

The list is transferred from file to working memory, where individual changes can be made more rapidly.

Example: `:SOUR:LIST:LOAD`

:SOURce
:LIST
:PDELay
:AUTO

Parameters: <BOOLEAN PROGRAM DATA>

state

Valid values: state: OFF | ON

Description: Sets the point delay time automatically to achieve the fastest possible stepping rate.

This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:PDEL:AUTO ON`

:SOURce
:LIST
:PDELay
:AUTO?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Reads automatic point delay setting.

This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:PDEL:AUTO?`

:SOURce
:LIST
:PDELay
:TIME

Parameters: <NUMERIC VALUE>

Valid values: point delay: real

Suffix: A suffix of either ms or s is accepted for time. If no suffix is entered then the default suffix of s is assumed.

Description: Sets the delay time for each point during a list sweep. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:PDEL:TIME 10.0ms`

:SOURce
:LIST
:PDELay
:TIME?

Parameters: none

Response: <NR2>

Returned values: point delay: real

Description: Determine the point delay (in seconds) for a list sweep. Note that this command will return the current value of point delay set by the user regardless of whether auto mode is on or off. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:PDEL:TIME?`

:SOURce
:LIST
READ?

Parameters: none

Response: <NR1>, <NR3>, …, <NR3>
Number of points, Frequency at point 0, …, Frequency at point n-1

Returned values: Number of points in list: integer

Frequency at point 0: real

Frequency at point n-1: real.

Description: Read the frequency values for every source point for the currently defined list. This command returns the number of points in the list followed by zero or more frequency values. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:READ?`

:SOURce
:LIST
:RESet

Parameters: none

Description: Resets the list sweep to point 0. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:RESet`

:SOURce
:LIST
:REVerse

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Determines the sweep direction for a list sweep. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:REV OFF`

:SOURce
:LIST
:REVerse?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Read the sweep direction for a list sweep This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:REV?`

:SOURce
:LIST
:SAVE

Parameters: none

Description: Save modified list after appending new points. The list is transferred from working memory to file and brought into use.

Example: `:SOUR:LIST:SAVE`

:SOURce
:LIST
:STEP

Parameters:

Description: Steps to the next point in a list sweep. This command is equivalent to *TRG or an IEEE488.1 group execute trigger (GET) command. This command is only valid on variants that support list sweep and when the list trigger mode is set to "internal single".

Example: `:SOUR:LIST:STEP`

:SOURce
:LIST
TRIGger

Parameters: <CPD>

Valid values: list trigger mode: EXTernal | CONTinuous | SINGle

Description: Sets the trigger mode for a list sweep. This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:TRIG EXT`

:SOURce
:LIST
:TRIGger?

Parameters: none

Response: <CRD>

list trigger mode

Returned values: list trigger mode: EXT | CONT | SING

Description: Read the trigger mode for a list sweep This command is only valid on variants that support list sweep.

Example: `:SOUR:LIST:TRIG?`

:SOURce

:MODE

Parameters: <CPD>

source mode

Valid values: source mode: [POWer | FREQuency | CW]. Values other than those stated are rejected and an error generated.

Description: Set the source mode.

Valid source modes are:

POWer	Linear power sweep
FREQuency	Linear frequency sweep
CW	CW output

Example: `:SOUR:MODE POW`

Set power sweep mode.

:SOURce

:MODE?

Parameters: none

Response: <CRD>

source mode

Returned values: source mode: [POW | FREQ | CW]

Description: Determine the source mode.

Example: `:SOUR:MODE?`

:SOURce
:POWer
:LEVel

Parameters: <NUMERIC VALUE>

power level

Valid values: power level: real

Suffix: power level: A suffix of dBm is accepted for power. If no suffix is entered then the default suffix of dBm is assumed.

Description: This sets the source output power. This value is only used when the source is set to a frequency sweep mode or a CW frequency mode using :SOUR:MODE.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:POW:LEV 1.0`

Set output power to 1 dBm.

:SOURce
:POWer
:LEVel?

Parameters: none

Response: <NR2>

power level

Returned values: power level: real

Description: Determine the source output power.

Example: `:SOUR:POW:LEV?`

:SOURce
:POWer
:STARt

Parameters: <NUMERIC VALUE>

power start value

Valid values: power start value: real

Suffix: power start value: a suffix of dBm is accepted for power. If no suffix is entered then the default suffix of dBm is assumed.

Description: This sets the source power start value (the :SOUR:MODE command is used to specify the domain). This command is invalid if the domain is not power.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:POW:STAR 5`

Set the start power to 5dB.

:SOURce
:POWer
:STARt?

Parameters: none

Response: <NR2>

power start value

Returned values: power start value: real

Description: Determine the source power start value. This command is invalid if the domain is not power.

Example: `:SOUR:POW:STAR?`

:SOURce

:POWer

:STOP

Parameters: <NUMERIC VALUE>

power stop value

Valid values: power stop value: real

Suffix: power stop value: A suffix of dBm is accepted for power. If no suffix is entered then the default suffix of dBm is assumed.

Description: This sets the source power stop value (the :SOUR:MODE command is used to specify the domain). This command is invalid if the domain is not power.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:POW:STOP 10`

Set the stop power to 10 dB.

:SOURce

:POWer

:STOP?

Parameters: none

Response: <NR2>

power stop value

Returned values: power stop value: real

Description: Determine the source power stop value.

Example: `:SOUR:POW:STOP?`

:SOURce
:RF

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Set RF output on or off.

Example: `:SOUR:RF ON`

Set RF on.

:SOURce
:RF?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Determine whether RF output is on.

Example: `:SOUR:RF?`

:SOURce

:SBANdwidth

:MICRowave

Parameters: <CPD>

loop bandwidth state

Valid values: loop bandwidth state: [FAST | SLOW]. Values other than those stated are rejected and an error generated.

Description: Set the loop bandwidth state for the source output block.

This value will only be used if the loop bandwidth control has been set to manual using SOUR:SBAN:MODE MAN.

Example: `:SOUR:SBAN:MICR FAST`

Set the loop bandwidth state to fast settling mode.

:SOURce

:SBANdwidth

:MICRowave?

Parameters: none

Response: <CRD>

loop bandwidth state

Returned values: loop bandwidth state: [FAST | SLOW]

Description: Determine the synthesizer loop bandwidth state for the source output block.

This command will always return the setting that is being used by the hardware.

Example: `:SOUR:SBAN:MICR?`

:SOURce

:SBANdwidth

:MODE

Parameters: <CPD>

loop bandwidth mode

Valid values: loop bandwidth mode: [AUTO | MANual]. Values other than those stated are rejected and an error generated.

Description: Set the loop bandwidth mode.

Setting AUTO mode will make the instrument determine the appropriate values for the RF and microwave loop bandwidth settings. Values set using SOUR:SBAN:RF and SOUR:SBAN:MICR will be ignored.

Setting MANual mode enables the two commands (SOUR:SBAN:RF and SOUR:SBAN:MICR) so that the user can specify how the loop bandwidth should be set.

Example: `:SOUR:SBAN:MODE AUTO`

Set the loop bandwidth mode to automatic.

:SOURce

:SBANdwidth

:MODE?

Parameters: none

Response: <CRD>

loop bandwidth mode

Returned values: loop bandwidth mode: [AUTO | MAN]

Description: Determine the loop bandwidth mode.

Example: `:SOUR:SBAN:MODE?`

:SOURce

:SBANdwidth

:RF

Parameters: <CPD>

loop bandwidth state

Valid values: loop bandwidth state: [FAST | SLOW]. Values other than those stated are rejected and an error generated.

Description: Set the loop bandwidth state for the core block.

This value will only be used if the loop bandwidth control has been set to manual using SOUR:SBAN:MODE MAN.

Example: `:SOUR:SBAN:RF FAST`

Set the loop bandwidth state to fast settling mode.

:SOURce

:SBANdwidth

:RF?

Parameters: none

Response: <CRD>

loop bandwidth state

Returned values: loop bandwidth state: [FAST | SLOW]

Description: Determine the loop bandwidth state for the core block.

This command will always return the setting that is being used by the hardware.

Example: `:SOUR:SBAN:RF?`

:SOURce
:SWEep
:AUTO

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Enable/disable automatic setting of sweep time.

Example: `:SOUR:SWE:AUTO OFF`

Enable sweep time to be set by the user.

:SOURce
:SWEep
:AUTO?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Determine whether sweep time is set automatically.

Example: `:SOUR:SWE:AUTO?`

:SOURce
:SWEep
:POINts

Parameters: <NUMERIC VALUE>

number of points

Valid values: number of points: integer

Suffix: number of points: No suffix is allowed.

Description: Set the number of sweep points.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:SWE:POIN 201`

Set number of points to 201.

:SOURce
:SWEep
:POINts?

Parameters: none

Response: <NR1>

number of points

Returned values: number of points: integer

Description: Determine the number of source sweep points.

Example: `:SOUR:SWE:POIN?`

:SOURce
:SWEep
:TIME

Parameters: <NUMERIC VALUE>

sweep time

Valid values: sweep time: real

Suffix: sweep time: A suffix of either ms or s is accepted for time. If no suffix is entered then the default suffix of s is assumed.

Description: Set the sweep time. Setting a user sweep time will disable the automatic sweep time function.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:SWE:TIME 0.5`

Set a sweep time of 500 ms.

:SOURce
:SWEep
:TIME?

Parameters: none

Response: <NR2>

sweep time

Returned values: sweep time: real

Description: Determine the sweep time (in seconds). Note that this command will return the current value of sweep time regardless of whether it was set automatically or by the user.

Example: `:SOUR:SWE:TIME?`

:SOURce
:VOUTput
:MODE

Parameters: <CPD>

voltage output mode

Valid values: voltage output mode: [VRAMp | YAXis | FVOLtage]. Values other than those stated are rejected and an error generated.

Description: Set the mode for the VOLTAGE OUTPUT located on the rear panel. The available modes are:

VRAMp	voltage ramp (0-20 V)
YAXis	live Y-axis. Voltage follows active marker response value
FVOLtage	Fixed voltage, user settable value

Example: `:SOUR:VOUT:MODE VRAM`

Set the VOLTAGE OUTPUT to voltage ramp mode.

:SOURce
:VOUTput
:MODE?

Parameters: none

Response: <CRD>

voltage output mode

Returned values: voltage output mode: [VRAM | YAX | FVOL]

Description: Read the VOLTAGE OUTPUT mode.

Example: `:SOUR:VOUT:MODE?`

:SOURce
:VOUTput
:VALue

Parameters: <NUMERIC VALUE>

voltage

Valid values: voltage: real

Suffix: voltage: A suffix of either mV or V is accepted for voltage. If no suffix is entered then the default suffix of V is assumed.

Description: Set the fixed voltage value for the voltage output when the mode is set to fixed voltage mode.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:SOUR:VOUT:VAL 2`

Set the voltage output fixed voltage to 2V.

:SOURce
:VOUTput
:VALue?

Parameters: none

Response: <NR2>

voltage

Returned values: voltage: real

Description: Determine the fixed voltage

Example: `:SOUR:VOUT:VAL?`

STATus subsystem

STATus
- **OPERation**
  - **CONDition?**
  - **ENABle\?**
  - **[EVENt]?**
  - **NTRansition\?**
  - **PTRansition\?**
- **PRESet**
- **QUEStionable**
  - **CONDition?**
  - **ENABle\?**
  - **[EVENt]?**
  - **NTRansition\?**
  - **PTRansition\?**

:STATus

:OPERation

:CONDition?

Parameters: none

Response: <NR1>

register contents

Returned values: register contents: integer. Values are in the range 0 to 32767.

Description: Read the contents of the Operation Status Condition Register. This register returns the current state of the instrument. Reading the register does not affect its contents. This is a sixteen-bit register.

The meaning of each bit in the Operation Status Condition Register is given in Appendix C.

Example:
```
:STAT:OPER:COND?
```

:STATus
:OPERation
:ENABle

Parameters: <NRf>

mask

Valid values: mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the enable mask, which allows true conditions in the Operation Status Event Register to be reported in the summary bit (bit 7 in the Status Byte Register).

If a bit is 1 in the Operation Status Enable Register and its associated event bit (in the Operation Status Event Register) makes a transition to true, a positive transition will occur in the associated summary bit if that bit was previously 0.

Bit 15 of the mask value supplied is ignored since bit 15 of the Operation Status Enable Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:OPER:ENAB 32`

Program the mask associated with the Operation Status Event Register with the value 32 (0000 0000 0010 0000 in binary) to enable a positive transition in the summary bit when the instrument is waiting for trigger.

:STATus
:OPERation
:ENABle?

Parameters: none

Response: <NR1>

mask

Returned values: mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Operation Status Enable Register. This is a sixteen-bit register.

Example: `:STAT:OPER:ENAB?`

:STATus

:OPERation

[:EVENt]?

Parameters: none

Response: <NR1>

event register contents

Returned values: event register contents: integer. Values are in the range 0 to 32767.

Description: Read the contents of the Operation Status Event Register. Reading the register will clear it. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:OPER?`

:STATus
:OPERation
:NTRansition

Parameters: <NRf>

negative transition mask

Valid values: negative transition mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the negative transition filter, which allows transitions from 1 to 0 in the Operation Status Condition Register to be latched into the Operation Status Event Register.

Bit 15 of the mask value supplied is ignored since bit 15 of the Operation Status Negative Transition Filter Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:OPER:NTR 256`

Program the negative transition filter associated with the Operation Status Register with the value 256 (0000 0001 0000 0000 in binary) to enable the event register to be set when the instrument has reached the averaging target.

:STATus
:OPERation
:NTRansition?

Parameters: none

Response: <NR1>

negative transition mask

Returned values: negative transition mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Operation Status Negative Transition Filter Register. This is a sixteen-bit register.

Example: `:STAT:OPER:NTR?`

:STATus
:OPERation
:PTRansition

Parameters: <NRf>

positive transition mask

Valid values: positive transition mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the positive transition filter, which allows transitions from 0 to 1 in the Operation Status Condition Register to be latched into the Operation Status Event Register.

Bit 15 of the mask value supplied is ignored since bit 15 of the Operation Status Positive Transition Filter Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:OPER:PTR 32`

Program the positive transition filter associated with the Operation Status Register with the value 32 (0000 0000 0010 0000 in binary) to enable the event register to be set when the instrument is waiting for a trigger.

:STATus
:OPERation
:PTRansition?

Parameters: none

Response: <NR1>

positive transition mask

Returned values: positive transition mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Operation Status Positive Transition Filter Register. This is a sixteen-bit register.

Example: `:STAT:OPER:PTR?`

:STATus
:PRESet

Parameters: none

Description: Preset the Operation Status Enable Register and the Questionable Status Enable Register to zero.

Also defaults the Operation status transition filters and the Questionable status transition filters, see Appendix C for more details

Example: `:STAT:PRES`

:STATus

:QUEStionable

:CONDition?

Parameters: none

Response: <NR1>

register contents

Returned values: register contents: integer. Values are in the range 0 to 32767.

Description: Read the contents of the Questionable Status Condition Register. This register returns the current state of the instrument. Reading the register does not affect its contents. This is a sixteen-bit register.

The meaning of each bit in the Questionable Status Condition Register is given in Appendix C.

Example: `:STAT:QUES:COND?`

:STATus
:QUEStionable
:ENABle

Parameters: <NRf>

mask

Valid values: mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the enable mask, which allows true conditions in the Questionable Status Event Register to be reported in the summary bit (bit 3 in the Status Byte Register).

If a bit is 1 in the Questionable Status Enable Register and its associated event bit (in the Questionable Status Event Register) makes a transition to true, a positive transition will occur in the associated summary bit if that bit was previously 0.

Bit 15 of the mask value supplied is ignored since bit 15 of the Questionable Status Enable Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:QUES:ENAB 8`

Program the mask associated with the Questionable Status Event Register with the mask value 8 (0000 0000 0000 1000 in binary) to enable a positive transition in the summary bit when the source becomes unleveled.

:STATus
:QUEStionable
:ENABle?

Parameters: none

Response: <NR1>

mask

Returned values: mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Questionable Status Enable Register. This is a sixteen-bit register.

Example: `:STAT:QUES:ENAB?`

:STATus

:QUEStionable

[:EVENt]?

Parameters: none

Response: <NR1>

event register contents

Returned values: event register contents: integer. Values are in the range 0 to 32767.

Description: Read the contents of the Questionable Status Event Register. Reading the register will clear it. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:QUES?`

:STATus
:QUEStionable
:NTRansition

Parameters: <NRf>

negative transition mask

Valid values: negative transition mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the negative transition filter, which allows transitions from 1 to 0 in the Questionable Status Condition Register to be latched into the Questionable Status Event Register.

Bit 15 of the mask value supplied is ignored since bit 15 of the Questionable Status Negative Transition Filter Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:QUES:NTR 256`

Program the negative transition filter associated with the Questionable Status Register with the value 512 (0000 0010 0000 0000 in binary) to enable the event register to be set when limit checking passes (comes back into limit).

:STATus
:QUEStionable
:NTRansition?

Parameters: none

Response: <NR1>

negative transition mask

Returned values: negative transition mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Questionable Status Negative Transition Filter Register. This is a sixteen-bit register.

Example: `:STAT:QUES:NTR?`

:STATus
:QUEStionable
:PTRansition

Parameters: <NRf>

positive transition mask

Valid values: positive transition mask: integer. Valid values are 0 to 65535. Values outside range are rejected and an error generated.

Description: Sets the positive transition filter, which allows transitions from 0 to 1 in the Questionable Status Condition Register to be latched into the Questionable Status Event Register.

Bit 15 of the mask value supplied is ignored since bit 15 of the Questionable Status Positive Transition Filter Register is always zero. This is a sixteen-bit register.

See Appendix C for more details

Example: `:STAT:QUES:PTR 32`

Program the positive transition filter associated with the Questionable Status Register with the value 512 (0000 0010 0000 0000 in binary) to enable the event register to be set when limit checking fails.

:STATus
:QUEStionable
:PTRansition?

Parameters: none

Response: <NR1>

positive transition mask

Returned values: positive transition mask: integer. Values are in the range 0 to 32767.

Description: Read the mask from the Questionable Status Positive Transition Filter Register. This is a sixteen-bit register.

Example: `:STAT:QUES:PTR?`

STEP subsystem

STEP
- **FREQuency**
  - **AUTO\?**
  - **[VALue]\?**
- **POWer**
  - **DB\?**
  - **WATTs\?**
- **TIME**
  - **DELay\?**
  - **[TIME]\?**
- **UNITs\?**
- **VOLTage\?**

:STEP
:FREQuency
:AUTO

Parameters: <BOOLEAN PROGRAM DATA>

state

Description: Set whether the user or the instrument sets the frequency step. If the instrument is automatically setting the frequency step then changing the span will alter the frequency step so that it is always 0.1 times the span.

This is set 'on' at preset.

Example: `:STEP:FREQ:AUTO ON`

The instrument sets the frequency step.

:STEP
:FREQuency
:AUTO?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

state

Description: Determine whether the user or the instrument sets the frequency step.

Example: `:STEP:FREQ:AUTO?`

:STEP

:FREQuency [:VALue]

Parameters: <NUMERIC VALUE>

frequency step

Valid values: frequency step: real

Suffix: frequency step: The following suffixes are accepted for frequency: Hz, kHz, MHz and GHz. If no suffix is entered then the default suffix of Hz is assumed.

Description: Set the frequency step. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The frequency step set is only used when the parameter being altered is a frequency.

Setting an explicit frequency step automatically uncouples the frequency step from the span, see :STEP:FREQuency:AUTO.

See Appendix D for the special values that may be entered instead of a numeric value for NUMERIC VALUE.

Example: `:STEP:FREQ 5E6`

Set frequency step to 5 MHz.

:STEP

:FREQuency [:VALue]?

Parameters: none

Response: <NR2>

frequency step

Returned values: frequency step: real

Description: Determine the frequency step. This will always return the frequency step regardless of whether it was set by the user or the instrument.

Example: `:STEP:FREQ?`

:STEP
:POWer
:DB

Parameters: <NUMERIC VALUE>

db step

Valid values: db step: real

Suffix: db step: A suffix of dB is accepted for power. If no suffix is entered then the default suffix of dB is assumed.

Description: Set the dB step. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The dB step set is only used when the parameter being altered is power and displayed as dB.

The power step applies instrument wide.

Example: `:STEP:POW:DB 2`

Set db step to 2 dB.

:STEP
:POWer
:DB?

Parameters: none

Response: <NR2>

db step

Returned values: db step: real

Description: Determine the dB step.

Example: `:STEP:POW:DB?`

:STEP

:POWer

:WATTs

Parameters: <NUMERIC VALUE>

watts step

Valid values: watts step: real

Suffix: watts step: The following suffixes are accepted for power: mW, W and kW. If no suffix is entered then the default suffix of W is assumed.

Description: Set the watts step. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The watts step set is only used when the parameter being altered is power and displayed as watts.

The power step applies instrument wide.

Example: `:STEP:POW:WATT 0.1`

Set watts step to 0.1 watts.

:STEP

:POWer

:WATTs?

Parameters: none

Response: <NR2>

watts step

Returned values: watts step: real

Description: Determine the watts step.

Example: `:STEP:POW:WATT?`

:STEP

:TIME

:DELay

Parameters: <NUMERIC VALUE>

delay time step

Valid values: delay time step: real

Suffix: delay time step: The following suffixes are accepted for time: ps, ns, us, ms and s. If no suffix is entered then the default suffix of s is assumed.

Description: Set the time step for group delay in seconds. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The time step set is only used when the parameter being altered is a time (group delay).

The time step applies instrument wide.

Example: `:STEP:TIME:DEL 50E-6`

Set time step to 50 μs.

:STEP

:TIME

:DELay?

Parameters: none

Response: <NR3>

delay time step

Returned values: delay time step: real

Description: Determine the time step used for group delay time increment/decrement.

Example: `:STEP:TIME:DEL?`

:STEP

:TIME

[:TIME]

Parameters: <NUMERIC VALUE>

time step

Valid values: time step: real

Suffix: time step: The following suffixes are accepted for time: ms and s. If no suffix is entered then the default suffix of s is assumed.

Description: Set the time step in seconds. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The time step set is only used when the parameter being altered is a time.

The time step applies instrument wide.

Example: `:STEP:TIME 50E-3`

Set time step to 50 ms.

:STEP

:TIME

[:TIME]?

Parameters: none

Response: <NR3>

time step

Returned values: time step: real

Description: Determine the time step.

Example: `:STEP:TIME?`

:STEP

:UNITs

Parameters: <NRf>

units step

Valid values: units step: real

Description: Set the units step. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The units step set is only used when the parameter being altered is unitless.

The units step applies instrument wide.

Example: `:STEP:UNIT 4`

Set units step to 4.

:STEP

:UNITs?

Parameters: none

Response: <NR2>

units step

Returned values: units step: real

Description: Determine the units step.

Example: `:STEP:UNIT?`

:STEP

:VOLTage

Parameters: <NUMERIC VALUE>

voltage step

Valid values: voltage step: real

Suffix: voltage step: The following suffixes are accepted for voltage: mV, V and kV. If no suffix is entered then the default suffix of V is assumed.

Description: Set the voltage step. This is the amount that is added/subtracted from the current value when UP or DOWN is sent as a parameter instead of a numeric value. The voltage step set is only used when the parameter being altered is a voltage.

The voltage step applies instrument wide.

Example: `:STEP:VOLT 1`

Set voltage step to 1 V.

:STEP

:VOLTage?

Parameters: none

Response: <NR2>

voltage step

Returned values: voltage step: real

Description: Determine the voltage step.

Example: `:STEP:VOLT?`

SYSTem subsystem

```
SYSTem
        ADDRess
                [SELF]\?
                SOURce\?
        CONTroller\?
        DATE\?
        DIAGnostics
                DISPlay
        ERRor?
        FREQuency
                STANdard\?
        HOURs?
        IPRights?
        ISETtings
                COUNtry
                        CURRent?
                        DISK
                                INSTall
                                LIST?
                                NUMBer?
                                VERSion?
                        LIST?
                        NUMBer?
                        REMove
                        [SELect]
                        VERSion?
                DATE\?
                DPOint\?
                KEYBoard
                        CURRent?
                        DISK
                                INSTall
                                LIST?
                                NUMBer?
                                VERSion?
                        LIST?
                        NUMBer?
                        REMove
                        [SELect]
                        VERSion?
                LANGuage
                        CURRent?
                        DISK
                                INSTall
                                LIST?
                                NUMBer?
                                VERSion?
                        LIST?
                        NUMBer?
```

```
                REMove
                [SELect]
                VERSion
                        MINimum?
                        [NUMBer]?
        SEParator\?
        TIME\?
OPTions?
PRESet
SECRet\?
SERial
        BAUD\?
        BITS\?
        FCONtrol\?
        PARity\?
        SBITs\?
SETTings
        ID\?
        RECall
        SAVE
TIME\?
```

:SYSTem

:ADDRess
[:SELF]

Parameters: <NRf>

address

Valid values: address: integer. Valid values are 0 to 30. Values outside range are rejected and an error generated.

Description: Set the GPIB address of the instrument.

It is recommended that a *OPC? is executed prior to this command (and the resulting 1 read by the controller) and a delay is inserted after using this command to give the instrument time to execute it.

Example: `:SYST:ADDR 18`

Set instrument address to 18.

:SYSTem
:ADDRess
[:SELF]?

Parameters: none

Response: <NR1>

address

Returned values: address: integer. Values are in the range 0 to 30.

Description: Determine the GPIB address of the instrument.

Example: `:SYST:ADDR?`

:SYSTem
:ADDRess
:SOURce

Parameters: <NRf>

address

Valid values: address: integer. Valid values are 0 to 30. Values outside range are rejected and an error generated.

Description: Set the GPIB address of the external source that the instrument controls during some calibrations.

Example: `:SYST:ADDR:SOUR 9`

Set external source address to 9.

:SYSTem
:ADDRess
:SOURce?

Parameters: none

Response: <NR1>

address

Returned values: address: integer. Values are in the range 0 to 30.

Description: Determine the GPIB address of the external source.

Example: `:SYST:ADDR:SOUR?`

:SYSTem
:APPLication
:ARUN
[:SELect]

Parameters: <STRING PROGRAM DATA>

application

Valid values: application: string. Maximum length of 256 characters excluding quotes. Excess characters will be ignored.

Description: Selects the application that should be auto-run at power up and on preset.. The application string must be one of the strings read using :SYST:APPL:LIST? or an error will be generated. Selecting an application to be autorun will automatically turn on application auto-run.

Example: `:SYST:APPL:ARUN "INSERTION LOSS"`

Select insertion loss application to autorun at power up or preset.

:SYSTem
:APPLication
:ARUN
[:SELect]?

Parameters: none

Response: <STRING RESPONSE DATA>

application

Returned values: application: string. Maximum length of 256 characters excluding quotes.

Description: Determine which application is set up to be autorun. The name will be returned event if the auto-run state is off..

Example: `:SYST:APPL:ARUN?`

Determine which application will be autorun (if autorun is enabled).

:SYSTem

:CONTroller

Parameters: <CPD>

controller

Valid values: controller: [SERial | GPIB | NONE]. Values other than those stated are rejected and an error generated.

Description: This command sets how the instrument is being controlled. It can be controlled by either a controller on the GPIB bus or by a controller over RS-232. It is also possible to select no controller.

If GPIB controller is selected then the instrument will accept remote commands from the GPIB bus.

If serial controller is selected then the instrument will accept remote commands from the RS-232.

Example: `:SYST:CONT GPIB`

Select the GPIB bus for use by an external controller.

:SYSTem

:CONTroller?

Parameters: none

Response: <CRD>

controller

Returned values: controller: [SER | GPIB | NONE]

Description: Determine whether the instrument is accepting external control and if so, where from.

Example: `:SYST:CONT?`

:SYSTem

:DATE

Parameters: <NRf>, <NRf>, <NRf>

year, month, day

Valid values: year: integer

month: integer. Valid values are 1 to 12. Values outside range are rejected and an error generated.

day: integer. Valid values are 1 to 31. Values outside range are rejected and an error generated.

Description: Sets the date of the real-time clock. The year must be entered in full. Invalid dates, e.g. 1995,2,31, will be rejected and an error generated.

Example: `:SYST:DATE 1998, 8, 20`

Set the date to 20th August 1998.

:SYSTem

:DATE?

Parameters: none

Response: <NR1>, <NR1>, <NR1>

year, month, day

Returned values: year: integer
month: integer. Values are in the range 1 to 12.
day: integer. Values are in the range 1 to 31.

Description: Read the date of the real-time clock

Example: `:SYST:DATE?`

:SYSTem
:DIAGnostics
:DISPlay

Parameters: <CPD>

display diagnostics mode

Valid values: display diagnostics mode: [WHITe | BLACk | NORMal]. Values other than those stated are rejected and an error generated.

Description: This command allows the display to be tested for stuck pixels.

Setting the display to WHITe will turn all pixels on - allowing a pixels stuck off test.

Setting the display to BLACk will turn all pixels off - allowing a pixels stuck on test.

Sending NORMal returns the display back to the normal mode.

Sending any other command whilst in display test mode will action the command as normal but the effect on the display is undefined. It is recommended that the only non-query commands sent whilst in display test mode are :SYST:DIAG:DISP NORM, *RST or :SYST:PRES.

Example: `:SYST:DIAG:DISP WHIT`

Turn all the pixels on the display on (to test for any pixels stuck off).

:SYSTem
:ERRor?

Parameters: none

Response: <NR1>,<STRING RESPONSE DATA>

error number, error message string

Returned values: error number: integer
error message string: string

Description: Read the SCPI 1990.0 error number and error message from the head of the error queue.

Example: `:SYST:ERR?`

Example Response: `-112,"Program mnemonic too long"`

:SYSTem
:FREQuency
:STANdard

Parameters: <CPD>

frequency standard

Valid values: frequency standard: [INT | EX1 | EX10]. Values other than those stated are rejected and an error generated.

Description: Select a frequency standard for the instrument: internal, external 1 MHz or external 10 MHz.

This command is equivalent to SOUR:FREQ:STAN.

Example: `:SYST:FREQ:STAN EX1`

Select the rear panel FREQ STD INPUT/OUTPUT to accept a 1 MHz external frequency standard.

:SYSTem
:FREQuency
:STANdard?

Parameters: none

Response: <CRD>

frequency standard

Returned values: frequency standard: [INT | EX1 | EX10]

Description: Determine the frequency standard in use.

This command is equivalent to SOUR:FREQ:STAN?.

Example: `:SYST:FREQ:STAN?`

:SYSTem
:HOURs?

Parameters: none

Response: <NR1>

operating hours

Returned values: operating hours: integer

Description: Determine how long the instrument has been operating. The value returned is in units of hours, rounded to the nearest hour

Example: `:SYST:HOUR?`

:SYSTem

:IPRights?

Parameters: none

Response: <STRING RESPONSE DATA>

message

Returned values: message: string

Description: Return intellectual property rights message.

Example: `:SYST:IPR?`

Return IPR message.

:SYSTem

:ISETtings

:COUNtry

:CURRent?

Parameters: none

Response: <STRING RESPONSE DATA>

country in use

Returned values: country in use: string. Maximum length of 30 characters excluding quotes.

Description: Determine which county is selected. The instrument will always have at least one country available : UK. Other countries may be built into the instrument and further countries can be installed from removable storage. Use :SYST:ISET:COUN:LIST? to determine which countries are currently available on the instrument. Use :SYST:ISET:COUN[:SEL] to select a different country.

Example: `:SYST:ISET:COUN:CURR?`

:SYSTem
:ISETtings
:COUNtry
:DISK
:INSTall

Parameters: <STRING PROGRAM DATA>

country

Valid values: country: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Install a new country into the instrument along with its associated language and keyboard. The country string must be one of the strings read using :SYST:ISET:COUN:DISK:LIST? or an error will be generated. Once the new country has been installed into the instrument it can be selected using :SYST:ISET:COUN:SEL (it is not automatically selected).

Example: `:SYST:ISET:COUN:DISK:INST "FRANCE"`

Install default settings for France into the instrument.

:SYSTem
:ISETtings
:COUNtry
:DISK
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first country, ..., last country

Returned values: first country: string. Maximum length of 30 characters excluding quotes.
...
last country: string. Maximum length of 30 characters excluding quotes.

Description: List all countries on the removable storage that are available to be installed into the instrument. The removable storage containing the country(s) to be installed must be present. To install one of the countries listed, use :SYST:ISET:COUN:DISK:INST using one of the strings returned by this command.

Example: `:SYST:ISET:COUN:DISK:LIST?`

List all the countries on the removable storage

:SYSTem
:ISETtings
:COUNtry
:DISK
:NUMBer?

Parameters: none

Response: <NR1>

number of countries

Returned values: number of countries: integer

Description: This command is to be used in conjunction with :SYST:ISET:COUN:DISK:LIST. This command determines how many countries will be returned by the :SYST:ISET:COUN:DISK:LIST? command. This can be useful in reserving space for the :SYST:ISET:COUN:DISK:LIST? response.

Example: `:SYST:ISET:COUN:DISK:NUMB?`

Determine how many countries are on the removable storage

:SYSTem
:ISETtings
:COUNtry
:DISK
:VERSion?

Parameters: <STRING PROGRAM DATA>

country

Valid values: country: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

version number

Returned values: version number: integer

Description: Determine the version number of the specified country file on the removable storage. The country string must be one of the strings read using :SYST:ISET:COUN:DISK:LIST? or an error will be generated.

Example: `:SYST:ISET:COUN:DISK:VERS? "FRANCE"`

Determine version number for France *country file on the removable storage.*

:SYSTem
:ISETtings
:COUNtry
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first country, ..., last country

Returned values: first country: string. Maximum length of 30 characters excluding quotes.
...
last country: string. Maximum length of 30 characters excluding quotes.

Description: List all countries available in the instrument. A country may then be selected using :SYST:ISET:COUN with one of the strings returned by this command.

Example: `:SYST:ISET:COUN:LIST?`

List all the countries available.

:SYSTem
:ISETtings
:COUNtry
:NUMBer?

Parameters: none

Response: <NR1>

number of countries

Returned values: number of countries: integer

Description: This command is to be used in conjunction with :SYST:ISET:COUN:LIST. This command determines how many countries will be returned by the :SYST:ISET:COUN:LIST? command. This can be useful in reserving space for the :SYST:ISET:COUN:LIST? response.

Example: `:SYST:ISET:COUN:NUMB?`

Determine how many countries are available in the instrument.

:SYSTem
:ISETtings
:COUNtry
:REMove

Parameters: <STRING PROGRAM DATA>

country

Valid values: country: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Remove a county from the instrument.

Example: `:SYST:ISET:COUN:REM "FRANCE"`

Remove France country settings from the instrument.

:SYSTem
:ISETtings
:COUNtry
[:SELect]

Parameters: <STRING PROGRAM DATA>

country

Valid values: country: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Select a county. This will default all internationalization parameters to those normally associated with that country. The country string must be one of the strings read using :SYST:ISET:COUN:LIST? or an error will be generated.

Selecting a new country is equivalent to obeying the following commands

SYST:ISET:DATE
SYST:ISET:DPO
SYST:ISET:KEYB
SYST:ISET:LANG
SYST:ISET:SEP
SYST:ISET:TIME

with the default values for that country.

Example: `:SYST:ISET:COUN "UK"`

Select UK defaults.

:SYSTem

:ISETtings

:COUNtry

:VERSion?

Parameters: <STRING PROGRAM DATA>

country

Valid values: country: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

version number

Returned values: version number: integer

Description: Determine the version number of the specified country file installed in the instrument. The country string must be one of the strings read using :SYST:ISET:COUN:LIST? or an error will be generated.

Example: `:SYST:ISET:COUN:VERS? "FRANCE"`

Determine version number for France *country file installed on the instrument.*

:SYSTem
:ISETtings
:DATE

Parameters: <CPD>, <CPD>

date order, date separator

Valid values: date order: [MDY | YMD | DMY]. Values other than those stated are rejected and an error generated.
date separator: [SLASh | MINus | DOT]. Values other than those stated are rejected and an error generated.

Description: Select the order for the date output. The following are accepted:

MDY	gives format 12 18 2004
YMD	gives format 2004 12 18
DMY	gives format 18 12 2004

The separator character is placed between the 3 numbers that are output. The following are accepted:

SLASh	gives format 28/02/2004
MINus	gives format 28-02-2004
DOT	gives format 28.02.2004

Leading zeros are always displayed giving two digits for both the day and the month.

Example: `:SYST:ISET:DATE DMY,SLAS`

Select the 'UK format' using slashes to give e.g. 21/04/2004.

:SYSTem
:ISETtings
:DATE?

Parameters: none

Response: <CRD>, <CRD>

date order, date separator

Returned values: date order: [MDY | YMD | DMY]
date separator: [SLAS | MIN | DOT]

Description: Determine the format that will be used to output dates.

Example: `:SYST:ISET:DATE?`

:SYSTem
:ISETtings
:DPOint

Parameters: <CPD>

decimal point character

Valid values: decimal point character: [DOT | COMMa]. Values other than those stated are rejected and an error generated.

Description: Sets which character ('.' or ',') is used to separate the integral and fractional part of real numbers. Note that this does not alter how real numbers are output to a remote controller.

If the setting is changed to comma and the spreadsheet field separator (as set by :SYST:ISET:SEP) is also set to comma then the spreadsheet field separator will be forced to semicolon.

Example: `:SYST:ISET:DPO DOT`

Display numbers and output numbers to CSV memories as xx.yyy.

:SYSTem
:ISETtings
:DPOint?

Parameters: none

Response: <CRD>

decimal point character

Returned values: decimal point character: [DOT | COMM]

Description: Determine whether numbers are displayed with a '.' or a ',' for the decimal point.

Example: `:SYST:ISET:DPO?`

:SYSTem
:ISETtings
:KEYBoard
:CURRent?

Parameters: none

Response: <STRING RESPONSE DATA>

keyboard in use

Returned values: keyboard in use: string. Maximum length of 30 characters excluding quotes.

Description: Determine which keyboard is in use. The instrument will always have at least one keyboard available : UK. Other keyboards may be built into the instrument and further keyboards can be installed from removable storage. Use :SYST:ISET:KEYB:LIST? to determine which keyboards are currently available on the instrument. Use :SYST:ISET:KEYB[:SEL] to select a different keyboard.

Example: `:SYST:ISET:KEYB:CURR?`

:SYSTem
:ISETtings
:KEYBoard
:DISK
:INSTall

Parameters: <STRING PROGRAM DATA>

keyboard

Valid values: keyboard: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Install a new keyboard into the instrument. The keyboard string must be one of the strings read using :SYST:ISET:KEYB:DISK:LIST? or an error will be generated. Once the new keyboard has been installed into the instrument it can be selected using :SYST:ISET:KEYB:SEL (it is not automatically selected).

Example: `:SYST:ISET:KEYB:DISK:INST "FRENCH"`

Install French keyboard driver into the instrument.

:SYSTem
:ISETtings
:KEYBoard
:DISK
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first keyboard, ..., last keyboard

Returned values: first keyboard: string. Maximum length of 30 characters excluding quotes.
...
last keyboard: string. Maximum length of 30 characters excluding quotes.

Description: List all keyboards on the removable storage that are available to be installed into the instrument. The removable storage containing the keyboard(s) to be installed must be present. To install one of the keyboards listed, use :SYST:ISET:KEYB:DISK:INST using one of the strings returned by this command.

Example: `:SYST:ISET:KEYB:DISK:LIST?`

List all the keyboards on the removable storage

:SYSTem
:ISETtings
:KEYBoard
:DISK
:NUMBer?

Parameters: none

Response: <NR1>

number of keyboards

Returned values: number of keyboards: integer

Description: This command is to be used in conjunction with :SYST:ISET:KEYB:DISK:LIST. This command determines how many keyboards will be returned by the :SYST:ISET:KEYB:DISK:LIST? command. This can be useful in reserving space for the :SYST:ISET:KEYB:DISK:LIST? response.

Example: `:SYST:ISET:KEYB:DISK:NUMB?`

Determine how many keyboards are on the removable storage

:SYSTem
:ISETtings
:KEYBoard
:DISK
:VERSion?

Parameters: <STRING PROGRAM DATA>

keyboard

Valid values: keyboard: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

version number

Returned values: version number: integer

Description: Determine the version number of the specified keyboard file on the removable storage. The keyboard string must be one of the strings read using :SYST:ISET:KEYB:DISK:LIST? or an error will be generated.

Example: `:SYST:ISET:KEYB:DISK:VERS? "FRENCH"`

Determine version number for French *keyboard file on the removable storage.*

:SYSTem
:ISETtings
:KEYBoard
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first keyboard, ..., last keyboard

Returned values: first keyboard: string. Maximum length of 30 characters excluding quotes.
...
last keyboard: string. Maximum length of 30 characters excluding quotes.

Description: List all keyboards available in the instrument. A keyboard may then be selected using :SYST:ISET:KEYB with one of the strings returned by this command.

Example: `:SYST:ISET:KEYB:LIST?`

List all the keyboards available.

:SYSTem
:ISETtings
:KEYBoard
:NUMBer?

Parameters: none

Response: <NR1>

number of keyboards

Returned values: number of keyboards: integer

Description: This command is to be used in conjunction with :SYST:ISET:KEYB:LIST. This command determines how many keyboards will be returned by the :SYST:ISET:KEYB:LIST? command. This can be useful in reserving space for the :SYST:ISET:KEYB:LIST? response.

Example: `:SYST:ISET:KEYB:NUMB?`

Determine how many keyboards are available in the instrument.

:SYSTem
:ISETtings
:KEYBoard
:REMove

Parameters: <STRING PROGRAM DATA>

keyboard

Valid values: keyboard: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Remove a keyboard driver from the instrument.

Example: `:SYST:ISET:KEYB:REM "GERMAN"`

Remove German keyboard driver.

:SYSTem
:ISETtings
:KEYBoard
[:SELect]

Parameters: <STRING PROGRAM DATA>

keyboard

Valid values: keyboard: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Select a keyboard. The keyboard string must be one of the strings read using :SYST:ISET:KEYB:LIST? or an error will be generated.

To install new keyboard layouts onto the instrument it is necessary to use the :SYST:ISET:COUN:DISK:INST command to install all the data for a particular country. For instance to install the keyboard for a Spanish keyboard, install the data associated with the country Spain and then use this command to select the Spanish keyboard that will now be present on the instrument.

Example: `:SYST:ISET:KEYB "UK"`

Select UK keyboard.

:SYSTem
:ISETtings
:KEYBoard
:VERSion?

Parameters: <STRING PROGRAM DATA>

keyboard

Valid values: keyboard: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>

version number

Returned values: version number: integer

Description: Determine the version number of the specified keyboard file installed in the instrument. The keyboard string must be one of the strings read using :SYST:ISET:KEYB:LIST? or an error will be generated.

Example: `:SYST:ISET:KEYB:VERS? "FRENCH"`

Determine version number for French *keyboard driver installed on the instrument.*

:SYSTem
:ISETtings
:LANGuage
:CURRent?

Parameters: none

Response: <STRING RESPONSE DATA>

language in use

Returned values: language in use: string. Maximum length of 30 characters excluding quotes.

Description: Determine which language is in use. The instrument will always have at least one language available : ENGLISH. Other languages may be built into the instrument and further languages can be installed from removable storage. Use :SYST:ISET:LANG:LIST? to determine which languages are currently available on the instrument. Use :SYST:ISET:LANG[:SEL] to select a different language.

Example: `:SYST:ISET:LANG:CURR?`

:SYSTem
:ISETtings
:LANGuage
:DISK
:INSTall

Parameters: <STRING PROGRAM DATA>

language

Valid values: language: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Install a new language into the instrument. The language string must be one of the strings read using :SYST:ISET:LANG:DISK:LIST? or an error will be generated. Once the new language has been installed into the instrument it can be selected using :SYST:ISET:LANG:SEL (it is not automatically selected).

Example: `:SYST:ISET:LANG:DISK:INST "FRENCH"`

Install French language into the instrument.

:SYSTem
:ISETtings
:LANGuage
:DISK
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first language, ..., last language

Returned values: first language: string. Maximum length of 30 characters excluding quotes.
...
last language: string. Maximum length of 30 characters excluding quotes.

Description: List all languages on the removable storage that are available to be installed into the instrument. The removable storage containing the language(s) to be installed must be present. To install one of the languages listed, use :SYST:ISET:LANG:REMOVABLE STORAGE:INST using one of the strings returned by this command.

Example: `:SYST:ISET:LANG:REMOVABLE STORAGE:LIST?`

List all the languages on the removable storage

:SYSTem
:ISETtings
:LANGuage
:REMOVABLE STORAGE
:NUMBer?

Parameters: none

Response: <NR1>

number of languages

Returned values: number of languages: integer

Description: This command is to be used in conjunction with :SYST:ISET:LANG:REMOVABLE STORAGE:LIST. This command determines how many languages will be returned by the :SYST:ISET:LANG:REMOVABLE STORAGE:LIST? command. This can be useful in reserving space for the :SYST:ISET:LANG:REMOVABLE STORAGE:LIST? response.

Example: `:SYST:ISET:LANG:REMOVABLE STORAGE:NUMB?`

Determine how many languages are on the removable storage

:SYSTem

:ISETtings

:LANGuage

:REMOVABLE STORAGE

:VERSion?

Parameters: <STRING PROGRAM DATA>

language

Valid values: language: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>, <NR1>

version number of display strings, version number of error strings

Returned values: version number of display strings: integer

version number of error strings: integer

Description: Determine the version number of the specified language file on the removable storage. The language string must be one of the strings read using :SYST:ISET:LANG:REMOVABLE STORAGE:LIST? or an error will be generated.

Example: `:SYST:ISET:LANG:REMOVABLE STORAGE:VERS? "FRENCH"`

Determine version number for French *language file on the removable storage.*

:SYSTem
:ISETtings
:LANGuage
:LIST?

Parameters: none

Response: <STRING RESPONSE DATA>, ..., <STRING RESPONSE DATA>

first language, ..., last language

Returned values: first language: string. Maximum length of 30 characters excluding quotes.
...
last language: string. Maximum length of 30 characters excluding quotes.

Description: List all languages available in the instrument. A language may then be selected using :SYST:ISET:LANG with one of the strings returned by this command.

Example: `:SYST:ISET:LANG:LIST?`

List all the languages available.

:SYSTem
:ISETtings
:LANGuage
:NUMBer?

Parameters: none

Response: <NR1>

number of languages

Returned values: number of languages: integer

Description: This command is to be used in conjunction with :SYST:ISET:LANG:LIST. This command determines how many languages will be returned by the :SYST:ISET:LANG:LIST? command. This can be useful in reserving space for the :SYST:ISET:LANG:LIST? response.

Example: `:SYST:ISET:LANG:NUMB?`

Determine how many languages are available in the instrument.

:SYSTem
:ISETtings
:LANGuage
:REMove

Parameters: <STRING PROGRAM DATA>

language

Valid values: language: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Remove specified language support from the instrument.

Example: `:SYST:ISET:LANG:REM "SPANISH"`

Remove Spanish language support.

:SYSTem
:ISETtings
:LANGuage
[:SELect]

Parameters: <STRING PROGRAM DATA>

language

Valid values: language: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Description: Select a language for displayed text. The language string must be one of the strings read using :SYST:ISET:LANG:LIST? or an error will be generated.

Selecting a new language will affect text displayed on the screen and the text in the GPIB error messages.

Example: `:SYST:ISET:LANG "ENGLISH"`

Select English language.

:SYSTem
:ISETtings
:LANGuage
:VERSion
:MINimum?

Parameters: none

Response: <NR1>, <NR1>

version number of display strings, version number of error strings

Returned values: version number of display strings: integer

version number of error strings: integer

Description: Determine the minimum language version numbers that can be used with the instrument. Language files with older version numbers than this cannot be used with the instrument.

Example: `:SYST:ISET:LANG:VERS:MIN?`

Determine minimum version numbers for language files that may be used with the instrument.

:SYSTem
:ISETtings
:LANGuage
:VERSion
[:NUMBer]?

Parameters: <STRING PROGRAM DATA>

language

Valid values: language: string. Maximum length of 30 characters excluding quotes. Excess characters will be ignored.

Response: <NR1>, <NR1>

version number of display strings, version number of error strings

Returned values: version number of display strings: integer

version number of error strings: integer

Description: Determine the version number of the specified language file installed in the instrument. The language string must be one of the strings read using :SYST:ISET:LANG:LIST? or an error will be generated.

Example: `:SYST:ISET:LANG:VERS? "FRENCH"`

Determine version number for French *language installed on the instrument.*

:SYSTem
:ISETtings
:SEParator

Parameters: <CPD>

separator

Valid values: separator: [SEMicolon | COMMa]. Values other than those stated are rejected and an error generated.

Description: Sets which character (';' or ',') is used to separate the values output to CSV format memories.

If the setting is changed to comma and the decimal point character (as set by :SYST:ISET:DPO) is also set to comma then the decimal point character will be forced to dot.

Example: `:SYST:ISET:SEP SEM`

Separate values saved to CSV memories with a semicolon.

:SYSTem
:ISETtings
:SEParator?

Parameters: none

Response: <CRD>

separator

Returned values: separator: [SEM | COMM]

Description: Determine whether the values output to a CSV memory are separated with a semicolon or a comma.

Example: `:SYST:ISET:SEP?`

:SYSTem
:ISETtings
:TIME

Parameters: <BOOLEAN PROGRAM DATA>, <CPD>

24 hour format, time separator

Valid values: time separator: [COLon | COMMa | DOT]. Values other than those stated are rejected and an error generated.

Description: Selects whether times are output as twelve (OFF) or twenty-four (ON) hour format and which character is placed between the three numbers that are output. The following are accepted:

COLon	gives format 22:02:19 or 10:02:19p
COMMa	gives format 22,02,19 or 10,02,19p
DOT	gives format 22.02.19 or 10.02.19p

Leading zeros are always displayed except for hours displayed in 12-hour format.

Example: `:SYST:ISET:TIME ON,COL`

Select the 'UK format' using colons to give e.g. 13:04:59.

:SYSTem
:ISETtings
:TIME?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>, <CRD>

24 hour format, time separator

Returned values: time separator: [COL | COMM | DOT]

Description: Determine the format that will be used to output times.

Example: `:SYST:ISET:TIME?`

:SYSTem

:OPTions?

Parameters: none

Response: <NR1>

options

Returned values: options: integer. Values are in the range 0 to 32767.

The returned value is a sixteen bit value *with each set bit representing the presence of an option:*

Bit Number	Bit Value	Option Present If Bit Set
0	1	SPARE
1	2	70 dB Attenuator (46 GHz)
2	4	70 dB Attenuator (20 GHz)
3	8	90 dB Attenuator (24 GHz)
4	16	SPARE
5	32	SPARE
6	64	AM & Wideband FM Demodulator
7	128	SPARE
8	256	Field replaceable connectors
9	512	SPARE
10	1024	Source Frequency Modulation
11	2048	High Power
12	4096	Source FM (external modulation only)
13	8192	SPARE
14	16384	SPARE
15	32768	Always zero

This command can be used instead of *OPT? if it is easier to decode than the text strings returned by *OPT?.

Bits 10 and 12 are mutually exclusive. Bit 10 will be set if the internal FM option is present (and therefore both internal and external FM is available) otherwise bit 12 will be set to indicate that external FM only is present.

Description: Read hardware options present.

Example: `:SYST:OPT?`

:SYSTem

:PRESet

Parameters: none

Description: Preset the instrument.

To place the instrument in its default state, use *RST. See Appendix E for details on which parameters are not affected by *RST or SYST:PRES.

See also *RST in Common Commands. Note that this command is not identical to *RST.

Example: `:SYST:PRES`

Preset the instrument.

:SYSTem

:SECRet

Parameters: <BOOLEAN PROGRAM DATA>

secret frequency display

Description: When selected, all X-axis frequency information will be removed from the display and hardcopy.

Does not affect frequency values returned to remote controllers.

Example: `:SYST:SECR ON`

Stop displaying frequency information.

:SYSTem

:SECRet?

Parameters: none

Response: <BOOLEAN RESPONSE DATA>

secret frequency display

Description: Determine whether frequency information is being displayed or not.

Example: `:SYST:SECR?`

:SYSTem

:SERial

:BAUD

Parameters: <NRf>

baud rate

Valid values: baud rate: integer. Valid values are 1200 to 115200. Values outside range are clipped.

Description: Set the serial interface baud rate. The same rate is used for transmission and reception of data. The following values are valid and the nearest will be used:
1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

If this command is being sent over the RS232 port then it is recommended that it is the last command in the program message. A delay should be inserted before sending any further commands at the new baud rate.

Example: `:SYST:SER:BAUD 19200`

Set RS232 serial interface baud rate to 19200.

:SYSTem

:SERial

:BAUD?

Parameters: none

Response: <NR1>

baud rate

Returned values: baud rate: integer

Description: Determine the serial interface baud rate.

Example: `:SYST:SER:BAUD?`

:SYSTem
:SERial
:BITS

Parameters: <NRf>

data bits

Valid values: data bits: integer. Valid values are 7 to 8. Values outside range are clipped.

Description: Set the number of data bits sent/received over the RS232 serial bus.

The usual setting for most printers is 8 data bits, no parity and 1 stop bit.

Example: `:SYST:SER:BITS 8`

Set the number of data bits transmitted per byte over the RS232 to 8 bits.

:SYSTem
:SERial
:BITS?

Parameters: none

Response: <NR1>

data bits

Returned values: data bits: integer. Values are in the range 7 to 8.

Description: Determine the number of data bits used for transmissions over the serial interface.

Example: `:SYST:SER:BITS?`

:SYSTem
:SERial
:FCONtrol

Parameters: <CPD>

flow control method

Valid values: flow control method: [NONE | XON | HARDware]. Values other than those stated are rejected and an error generated.

Description: Set the flow control method for the RS232 serial port:

NONE	No flow control method in use. Data can be lost if the receiving device is slower than the transmitting device.
XON	Use software handshaking (XON and XOFF).
HARDware	Use hardware handshaking (RTS and CTS).

Note that to use hardware handshaking, the cable in use must contain the correct wires to support the hardware handshaking method.
Both handshaking methods will only work if both devices connected are using the specified method.

Example: `:SYST:SER:FCON HARD`

Set RS232 serial interface to use hardware handshaking.

:SYSTem
:SERial
:FCONtrol?

Parameters: none

Response: <CRD>

flow control method

Returned values: flow control method: [NONE | XON | HARD]

Description: Determine the serial interface flow control method.

Example: `:SYST:SER:FCON?`

:SYSTem
:SERial
:PARity

Parameters: <CPD>

parity

Valid values: parity: [NONE | EVEN | ODD]. Values other than those stated are rejected and an error generated.

Description: Set the parity for the RS232 serial interface:

NONE	No parity checking in use.
EVEN	Use even parity checking.
ODD	Use odd parity checking.

The usual setting for most printers is 8 data bits, no parity and 1 stop bit.

Example: `:SYST:SER:PAR NONE`

Set parity checking off.

:SYSTem
:SERial
:PARity?

Parameters: none

Response: <CRD>

parity

Returned values: parity: [NONE | EVEN | ODD]

Description: Determine the serial interface parity checking.

Example: `:SYST:SER:PAR?`

:SYSTem
:SERial
:SBITs

Parameters: <NRf>

stop bits

Valid values: stop bits: integer. Valid values are 1 to 2. Values outside range are clipped.

Description: Set the number of stop bits sent/received over the RS232 serial bus.

The usual setting for most printers is 8 data bits, no parity and 1 stop bit.

Example: `:SYST:SER:SBIT 1`

Set the number of stop bits to 1.

:SYSTem
:SERial
:SBITs?

Parameters: none

Response: <NR1>

stop bits

Returned values: stop bits: integer. Values are in the range 1 to 2.

Description: Determine the number of stop bits used for transmissions over the serial interface.

Example: `:SYST:SER:SBIT?`

:SYSTem
:SETTings
:ID

Parameters: <STRING PROGRAM DATA>, <STRING PROGRAM DATA>

file name, user id

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

user id: string

Description: Set the user entered id string of the specified settings store.

Example: `:SYST:SETT:ID "john02", "My favorite settings"`

:SYSTem
:SETTings
:ID?

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Response: <STRING RESPONSE DATA>

id string

Returned values: id string: string

Description: Read the user entered id string of the specified source power calibration. The id string gives additional details of the power calibration store over what can be determined from the file name alone.

Example: `:SYST:SETT:ID? "mysett"`

:SYSTem

:SETTings

:RECall

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Recall instrument settings from a store. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if reading from removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select instrument memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

If it is necessary to set up the instrument from saved settings (downloaded to the controller previously) then this can be done by first loading the data back to a specified settings store and then recalling that store:

```
:MMEM:MSIS “C”
:MMEM:WRIT:SETT “temp”, #..lots of binary data...
;SYST:SETT:REC “temp”
:MMEM:DEL “temp.set”
```

Example: `:SYST:SETT:REC "AER_11"`

Recall settings from store AER_11.

:SYSTem

:SETTings

:SAVE

Parameters: <STRING PROGRAM DATA>

file name

Valid values: file name: string. Maximum length of 8 characters excluding quotes. Excess characters will be ignored.

Description: Save current instrument settings to a store. The store will be accessed using the file name sent as part of this command, together with the currently selected storage device (internal memory or removable storage) and the current directory (if writing to removable storage). A file extension should not be specified as this is fixed by the instrument.

Use :MMEM:MSIS to select instrument memory or removable storage. Use :MMEM:CDIR to select the required directory when accessing the removable storage.

If it is necessary to transfer the current settings to the controller, this can be done by saving to a specified store and then transferring that store to the controller. The store can then be deleted:

```
MMEM:MSIS “C”
:SYST:SETT:SAVE “temp”
:MMEM:READ:SETT? “temp”
:MMEM:DEL “temp.set”
```

Example:

```
:SYST:SETT:SAVE "AER_5"
```

Save instrument settings to store AER_5.

:SYSTem

:TIME

Parameters: <NRf>, <NRf>, <NRf>

hours, minutes, seconds

Valid values: hours: integer. Valid values are 0 to 23. Values outside range are rejected and an error generated.

minutes: integer. Valid values are 0 to 59. Values outside range are rejected and an error generated.

seconds: integer. Valid values are 0 to 59. Values outside range are rejected and an error generated.

Description: Sets the time of the real-time clock. The time is in 24-hour format.

Example: `:SYST:TIME, 14, 30, 0`

Set the time to 2:30 pm.

:SYSTem

:TIME?

Parameters: none

Response: <NR1>, <NR1>, <NR1>

hours, minutes, seconds

Returned values: hours: integer. Values are in the range 0 to 23.
minutes: integer. Values are in the range 0 to 59.
seconds: integer. Values are in the range 0 to 59.

Description: Read the time of the real-time clock.

Example: `:SYST:TIME?`

Chapter 5
BRIEF TECHNICAL DESCRIPTION

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Introduction

The description which follows is intended as an overview of the 6810A Series hardware, and relates to the functional block of the instrument as shown in Fig. 5-1, which is a simplified block schematic diagram of the instrument. A more detailed description is given in Chapter 1 of the Maintenance Manual.

System Control Board, A1/1

All the main control, processing and interface functions of the 6810A are carried out by the System Control board A1/1. This assembly consists of a main carrier board that supports two ETX-format computer modules. One of the ETX modules runs the Phar-Lap operating system and associated software to control the 6810A hardware. The second ETX module (known as the I/O processor) performs I/O interfacing functions (graphics and USB) running under the Linux operating system. The two ETX modules communicate with each other via a bi-directional FIFO link. The following are examples of the type of ETX module that may be used:

Phar-Lap processor

Intel® Celeron® M CPU 600 MHz, 512 MB RAM, providing the following features:

16-bit I/O

16-bit DMA

2 x IDE interfaces

parallel port

2 x serial ports

Interface to external PS/2 keyboard

I/O processor

AMD® LX800 CPU 500 MHz, 512 MB DRAM providing the following features:

2 x USB

2 x IDE

18-bit parallel LCD interface

VGA interface

The software for both processors resides on a Compact Flash (CF) memory card (one per processor). The CF card on the Phar-Lap side is also used to store factory pre-set data and user data.

Additionally, the A1/1 board provides the following features:

GPIB interface

Non-volatile RAM (NOVRAM)

Interface to front panel keyboard

Trigger and lock interface to replace the AT1 option board

The A1/1 board plugs into a dedicated slot in the system motherboard. All interfaces to the system (with the exception of USB and trigger/lock connections) are made via the system motherboard. Two motherboard connectors are provided: the ISA bus connector is a 96-way DIN41612, the remainder of the motherboard connections are made via a 192-way (4 x 48 row) 2 mm metric connector.

Frequency Standard Board, A2

The instrument requires a 10 MHz reference frequency; this is derived from a 100 MHz VCXO. When the instrument is set to internal standard, the VCXO is locked to a 10 MHz oven-controlled crystal oscillator (OCXO) using a phase-locked loop (PLL). The OCXO is tuned by the output of a DAC, which receives data from the ISA bus. A 10 MHz output is provided on the rear panel. Alternatively, the VCXO can be locked to a 1 or 10 MHz external standard (via the same rear panel connector).

Synthesized source

The instrument's signal source comprises:

Core Synthesizer Board, AS1, which utilizes a fractional-N synthesizer to generate signals over the range 1.5–3 GHz.

Frequency Band Selection & Control Board, AS2, which takes the AS1 output and produces output signals from 1 MHz to 1.5 GHz. It also contains the leveling control for RF and microwave signals.

Signal Conditioning Board, AS3, which provides amplification, level control and filtering of the signals generated by boards AS1 and AS2.

Core Synthesizer Board, AS1

A programmable divider (using the patented fractional-N architecture) generates signals in the range 1.5–3 GHz by phase-locking an oscillator to the 10 MHz reference signal output by the Frequency Standard Board, A2. To avoid the need for an oscillator that operates up to 3 GHz, a 500–667 MHz VCO is used and low-order harmonics are generated. The VCO output is fed to a harmonic generator to produce the 3rd, 4th and 5th harmonics; one of these is selected by a voltage-tuned filter to yield a signal in the range 1.5–3 GHz.

The frequency of the VCO is set to the required value by setting the correct division ratio and pre-steering the VCO; this is controlled by software via the digital interface

Frequency Band Selection & Control Board, AS2

In addition to generating signals from 1 MHz to 3 GHz, the AS2 board also acts as the master controller for the source, communicating with the System Control Board via the ISA bus.

The 1.5–3 GHz output from AS1 is divided by two and four to produce signals in the range 750–1500 MHz and 375–750 MHz respectively. A mixer is used to generate signals from 1 to 375 MHz; with a local oscillator of 1.5 GHz the corresponding mixer input frequency range is 1501–1875 MHz. The local oscillator is a 1.5 GHz VCO phase-locked to the 10 MHz reference frequency. PIN diode switches are used to select either the 1.5–3 GHz through path, one of the divider outputs, or the mixer output, which is fed to the AS3 board.

The leveling control circuit comprises the control circuitry for maintaining constant power levels at the outputs of AS3 and the microwave block. The output power levels are monitored by diode detectors, and the control loops provide drive signals for the corresponding PIN diode modulators. The leveling control circuit can also be used with an external detector or power meter, connected to the rear panel EXT LEVEL INPUT connector.

Signal Conditioning Board, AS3

The function of the AS3 board is to amplify the synthesized signal from AS2, and to reduce the harmonics present in the output signal (both the input signal and the power amplifier contribute towards the harmonic content). The board also provides a means for leveling the output power.

The 1 MHz–3 GHz output from AS2 is fed to a PIN diode modulator used as a variable attenuator. This forms part of the leveling system, the control circuitry residing on AS2. The signal is then passed to a power amplifier, which provides a nominal 27 dB of gain. This increases the AS2 output power and compensates for loss in the other signal conditioning circuits, to provide an output power > +10 dBm at the front panel over the entire frequency range.

The filter stage comprises 11 half-octave filter sections, which are switched in as appropriate to cover different bands.

A resistive pick-off provides a sample of the output signal to the diode detector, which gives a DC output voltage that is proportional to the power level. This is fed to the control circuit on AS2, which provides leveling control for signals below 3 GHz.

Microwave source block

The microwave source block provides the source frequencies covering the range 3–24 GHz. The frequencies are generated by a bank of up to five microwave VCOs (depending on the frequency range of the variant). Each VCO is followed by a low-pass filter to reduce harmonics. An SP6T PIN diode switch selects either one of the VCO outputs or the 1 MHz–3 GHz output from AS3.

A sample of the selected signal is passed to a phase-locked loop for phase-locking signals above 3 GHz to the 600–800 MHz local oscillator output from AS2.

The SP6T switch output is followed by a broadband PIN diode modulator which, together with a broadband directional coupler and control circuitry on AS2, form the leveling circuit for frequencies above 3 GHz. The leveling system is used to achieve constant power and good source match. The modulator is used to adjust the source output power level. If fitted, the optional step attenuator is fitted between the microwave block and the RF output connector.

Data Acquisition Board, AD1

The data acquisition system provides an amplifier chain for source level calibration. It has three inputs, only one of which is used in this instrument. The chain has two switched-gain stages, providing a total of 6 gain settings. A calibration DAC allows automatic calibration of each gain combination on each of the three amplifier chains. A further DAC is used for zeroing of the first amplifier stage. The output of the second amplifier stage is routed through a selectable bandwidth low-pass filter in order to reduce the noise floor. Data is then sampled in a sample-and-hold circuit. The sample-and-hold output is then multiplexed to a 16-bit ADC. The ADC output is passed via the ISA bus interface to the System Control Board for processing. Also passed to system control is the detector calibration data held in EEPROM within the detector.

Power supply

The power supply is a switched-mode unit that runs directly from the AC supply. The unit can accept AC voltages in the range 90 V–265 V at a frequency of 45 Hz to 65 Hz. It supplies DC voltages of +5 V, +6.5 V, +21.5 V, +24 V and ±18 V.

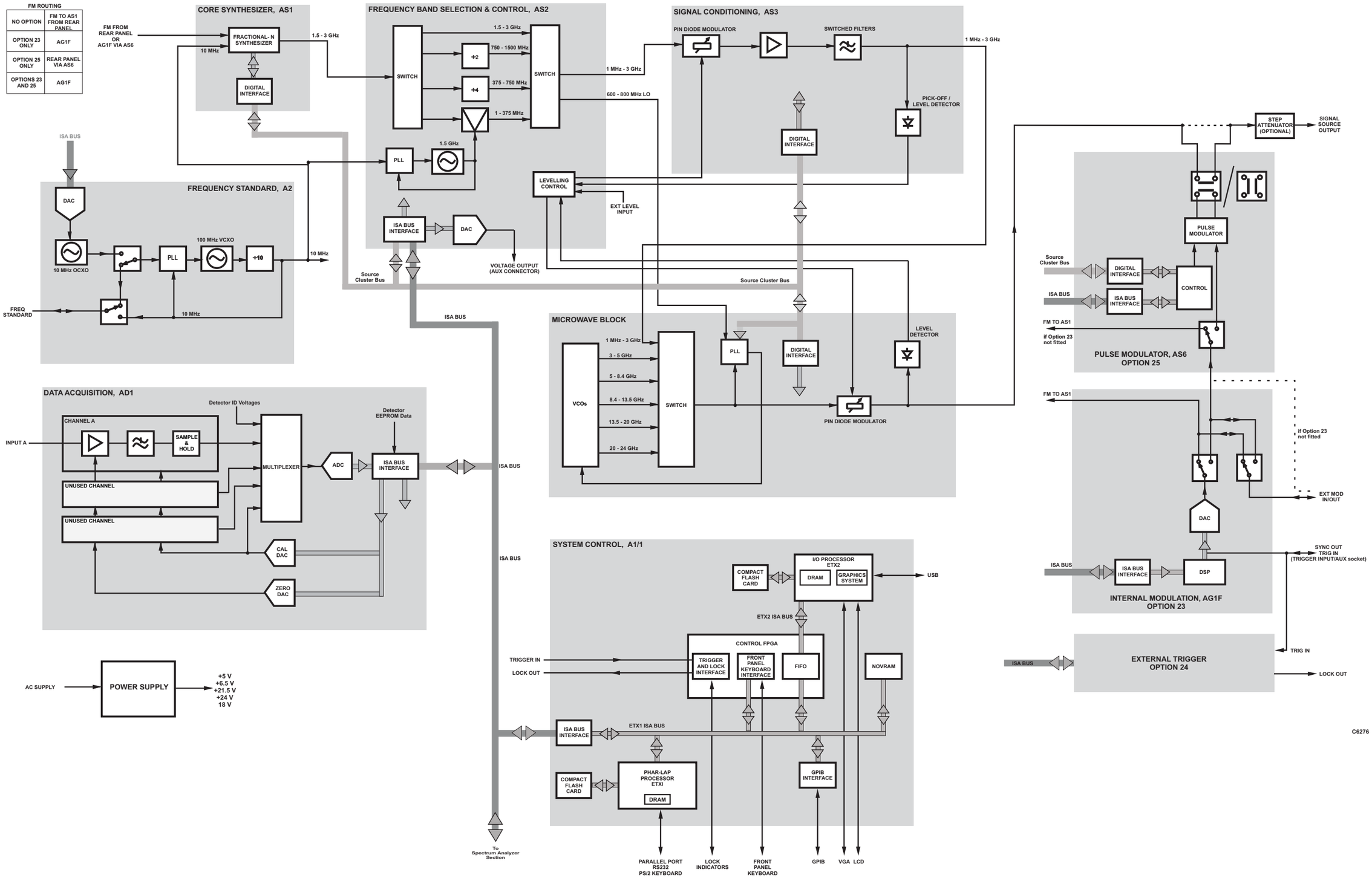

Fig. 5-1 System block diagram

System block diagram

Chapter 6
ACCEPTANCE TESTING

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Introduction 6-1
1 Power-on and configuration check 6-2
2 Source power check 6-2

Introduction

The following procedure is intended as a quick and convenient method for checking the basic functionality of a new instrument. For a full test of instrument performance against the published specification, refer to the 6800 Series Maintenance Manual.

EQUIPMENT REQUIRED

For all models:

Description	Minimum specification
Scalar detector	IFR 6230A or 6230L Series (frequency range and connector to match signal source output of unit under test)

1 Power-on and configuration check

(1) Connect an AC supply lead to the input connector on the rear panel and set the supply switch to the '⏽' position. Check on the front panel that the yellow LED adjacent to the SUPPLY switch is lit, indicating standby power is present.

(2) Press the SUPPLY switch on the front panel. As the instrument performs its power-on self tests, check that no errors are reported [1].

(3) Press the [UTILITY] key, then the *[Service], [Status]* and *[Display Build State]* soft keys. Check that the model and serial numbers are correctly reported and the frequency range(s) and hardware options correspond to the expected hardware configuration of the instrument.

Note **Allow the instrument to warm up for a minimum of 30 min before continuing with the following tests.**

2 Source power check

Input A

(1) Connect 6230A/L series detector to Input A and to the SIGNAL SOURCE OUTPUT.

(2) Press the [PRESET] key, then the *[Full]* soft key.

(3) Set the reference level to +20 dBm and the scaling to 5 dB per division as follows:

[SCALE/FORMAT]
[Set Scale...]
[5] [ENTER/=MKR]
[Set Ref Level...]
[2] [0] [ENTER/=MKR]

[SCALAR]
[Averaging]

(5) Zero the detector by pressing [CAL] *[Zero Detectors]*

(6) Set the frequency range to stop at 3 GHz by pressing:

[SOURCE]
[Set Stop Frequency...]
[3] [G n]

(7) Turn on the source output by pressing [SOURCE ON/OFF] and check that the output level appears as an approximately flat trace four divisions below the top of the graticule area.

Check that the "UNLEV" and "UNLOC" indicators do not appear in the general information area of the display.

(8) Use the active marker to find the points of minimum and maximum output power as follows:

[MARKER]
[Active Mkr to Minimum]

and

[Active Mkr to Maximum]

Observing the marker readout in the trace information area, check that the peak to peak difference between the minimum and maximum power does not exceed 0.9 dB (±0.7 dB internal levelling accuracy ±0.2 dB detector frequency response).

---

[1] If a power on self test error has occurred, press the [UTILITY] key, then the *[Service], [Status]* and *[Display Test Results]* soft keys for further details. Obtain a hard copy of the power on test results if necessary using the print function. Contact a Service Centre for further assistance.

(9) Increase the source output level to maximum by pressing:

[SOURCE]
[Set Output Power...]
[1] [0] [ENTER/=MKR] on standard units *, or

[8] [ENTER/=MKR] on units with step attenuator options installed *

* Reduce by 0.5 dB if optional field replaceable connectors are fitted.

Check that the output has increased to the correct level and that the "UNLEV" indicator does not appear in the general information area of the display.

Appendix A
INSTRUMENT DEFAULT SETTINGS

The default settings of the most commonly encountered instrument parameters and functions are given below. These are the settings that exist after [PRESET] *[Full]* has been pressed.

Parameters followed by ***** apply globally; these are instrument configuration settings and are not affected by PRESET (or recalling instrument settings). The default conditions apply if the data relevant to these parameters has become corrupted or lost

Parameter / function	Default value/state
Source control	
Source mode	Linear frequency sweep
Start frequency	Minimum
Stop frequency	Maximum
CW frequency	Minimum
Output power	0 dBm
Start power	Minimum leveled power (with attenuator option set to minimum)
Stop power	Maximum guaranteed output power
Frequency modulation (if FM Option fitted)	OFF
Sweep time control	Auto
User set sweep time	1 s
RF on/off	OFF
Leveling mode *	Internal
Frequency standard *	Internal
Voltage output mode	Fixed
Voltage output level	0 V
General	
Language *	UK English
Keyboard layout *	UK
Date format *	03 Jan 2008
Spreadsheet field separator *	,
Decimal point *	.
LCD backlight *	Maximum
LCD color palette *	Color
'Secret' function (freq annotation removed)	OFF
Limit checking	OFF
Hard copy device	HP DeskJet / LaserJet
Hard copy port assignment	*Printer* : Parallel

Appendix B
ERROR MESSAGES

This Appendix lists in alphabetical order all the errors that can be reported to the user via the display. The errors are grouped as follows:

System Error. This usually implies a hardware fault or corruption of data in a non-volatile store (page App B-2).

Instrument Warning. This is a warning to the user that the instrument is being used incorrectly (page App B-4).

Data Warning. This is a warning that the data that has been input is inappropriate (page App B-7).

An icon as shown above will be displayed on the screen to inform the user of the type of error that has been detected.

System error

A printer driver failed to load

A printer driver failed to load at power on. Try re-installing the printer driver.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Detector EEPROM data corrupted: Input: *<input identifier>* *<block type>* Block

Data stored in the detector EEPROM connected to the specified input has been found to be corrupt. Additional information relating to the specific block of data affected is provided for reference (Identity, Linearity or Flatness). The instrument will continue to make measurements using the affected detector but, because default correction data will be used, measurement accuracy will be affected.

Error detected while loading language files

An error was detected while loading language files. This may mean that a problem occurred when the language was being installed or that the files were found to be incompatible with the installed release of the instrument software. If this error occurs the instrument will revert to UK English.

Error reading or writing an ID ROM

An error occurred while reading or writing an ID ROM on one of the instrument modules, indicating a possible hardware fault.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Error Strings File out of date

The Error Strings File' has been found to be out of date for the installed version of the instrument's software. The instrument will continue to function, but some error messages may not be displayed. To ensure correct operation, an up-to-date 'Error Strings File' should be installed.

Failed to save calibration data

A failure occurred when the system was attempting to write calibration data to an internal store. The most likely reason is that there is insufficient free space on the instrument's flash card.

Additional space should be created by using the Store Management function (accessed via the [UTILITY] key) to delete unwanted files. The Store Management function may be used to transfer files to removable storage for safekeeping before they are deleted.

Frequency standard calibration failure

An error has occurred during a frequency standard calibration.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

General Strings File out of date

The 'General Strings File' has been found to be out of date for the installed version of the instrument's software. The instrument will continue to function, but some messages may not be displayed. To ensure correct operation, an up-to-date 'General Strings File' should be installed.

IDROM checksum failure

A checksum failure was detected when reading the ID ROM on one of the instrument modules.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Software upgrade failed

A problem has occurred while attempting to upgrade the instrument software. The specific failure is identified by the error code number.

In the unlikely event of this error occurring, contact Customer Support (contact details at rear of manual).

Source FM calibration failure

The source FM calibration has failed, indicating a possible hardware fault.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Source frequency calibration failure

An error has occurred during a source frequency calibration.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Source power calibration failure

An error has occurred during a source power calibration.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

Store corrupted

The specified store (whether internal or on removable storage) has been found to be corrupted. If the store is required for the operation of the instrument, it will be repaired by overwriting with default data.

Refer to the Maintenance Manual if the problem persists, or contact Customer Support (contact details at rear of manual).

The detector connected to input *<input identifier>* failed to zero

The instrument failed to zero the detector connected to the specified input (A).

Ensure that RF power is not applied to the detector during the zero operation (the source within the instrument itself is switched off automatically while a zero is in progress).

This operation requires the FM option

Remote control error. The operation requested is unavailable because the FM option is not present.

Instrument warning

Cannot abort. No printing in progress

A request to abort a print has been requested when there is no print in progress.

Cannot find the specified keyboard layout file

Remote control error. Cannot find the specified keyboard layout file. The most probable cause is mistyping the file name.

Cannot find the specified printer driver

Remote control error. A request to remove a printer driver file could not be actioned because the specified printer driver could not be found

Cannot reinstall an old software release

An attempt was made to restore a release of the software that is older than that currently installed. This is not allowed because it is possible that the software may be incompatible with newer system files present on the instrument's flash card.

If the attempt at re-installing the software is the result of a suspected software problem, contact Customer Support for advice (contact details at rear of manual).

Cannot remove country support

Remote control error. An attempt to remove country support using SYSTem:ISETtings:COUNtry :REMove failed because the specified country settings are currently in use.

Cannot remove keyboard driver

Remote control error. An attempt to remove a keyboard driver using SYSTem:ISETtings :KEYBoard:REMove failed because the specified keyboard driver is currently in use.

Cannot remove language support

Remote control error. An attempt to remove language support using SYSTem:ISETtings :LANGuage:REMove failed because the specified language is currently in use.

Cannot remove printer driver

The specified printer driver cannot be deleted as it is currently in use.

Cannot remove standard built-in printer driver

An attempt was made to delete the standard built-in printer driver, which is not allowed.

Cannot select source power calibration

When a source power calibration file is selected for use, the instrument checks to ensure that the frequency range covered by the calibration is available from the source. If that is not the case, this error message is displayed. The only reason why this error might occur is if the calibration file was created on a different variant of the instrument and transferred via the remote control interface or removable storage, so that the frequency range of the calibration exceeds that of the source.

Cannot select specified language

Remote control error. An attempt has been made to select a language that has not previously been installed.

Cannot send print data to another file

A file containing print data that was generated earlier can only be directed to the USB or parallel ports, but not another file.

Cannot set the Primary Password

Setting the Primary Password is not allowed.

Cannot transfer data to specified store

Remote control error. This error can occur when transferring the contents of a store to the instrument via the remote control interface if the number of data bytes transferred is fewer than expected for the store type.

Cannot transfer narrowband source power calibration to Primary

Source power calibrations over a narrower frequency range than the source is capable of providing may not be transferred to the primary calibration.

Set the Primary power calibration to cover the full frequency range of the source.

Cannot use the GPIB port to control an external device

Remote control error. The GPIB port has previously been set up as a talker / listener for remote control by another computer, so may not be used for controlling an external source.

Change the setting to 'Controlled by RS232' or 'No External Controller' to allow the GPIB port to take control of external devices.

Disk full or missing

The operation could not be completed because the internal memory is full or, in the case of removable storage, not present. Delete or move stores to make room for the new item.

External source driver is corrupt

An invalid external source store was detected. Parsing of the store detected an error condition.

Try re-installing the appropriate external source driver.

External source not found on gpib interface

An external source was not detected on the remote interface.

Check speed and/or address settings and cable connections.

File or directory not found

The required file or directory is not present, either internally or on removable storage.

Incorrect disk

During a software upgrade a removable storage device was inserted that was out of sequence or does not belong to the upgrade set.

Replace the device with the correct one and press the *[Continue]* key.

Instrument has failed to communicate with an external device

Remote control error. The instrument has failed to communicate with an external device.

Check speed and/or address settings (using [UTILITY]*[Remote]*) and cable connections.

Insufficient free space to perform software upgrade

The software upgrade cannot be performed because there is insufficient free space on the instrument's flash card.

Additional space should be created by using the Store Management function (accessed via the [UTILITY] key) to delete unwanted files. The Store Management function may be used to transfer files to removable storage for safekeeping before they are deleted.

Numeric keys not available

The front panel numeric keys cannot be used to set the value of the parameter currently enabled for numeric entry.

Operation not permitted while calibration is in progress

Remote control error. An illegal command has been received while an instrument calibration is in progress.

Password protected

The requested operation is not allowed because the store is password protected.

Printer busy

An attempt has been made to start a new print before the previous print has completed.

Query DEADLOCKED

Remote control error. Indicates that a condition causing a DEADLOCKED Query error occurred (see IEEE 488.2). This can occur if the input buffer and output buffer are full and the device cannot continue.

Query INTERRUPTED

Remote control error. Indicates that a condition causing an INTERRUPTED Query error occurred (see IEEE 488.2). This could occur, for example, if the instrument receives a data byte or a GET before it has completed sending a response to a previous command.

Query UNTERMINATED

Remote control error. Indicates that a condition causing an UNTERMINATED Query error occurred (see IEEE 488.2). The instrument may have been addressed to talk before it had received a complete program message.

Query UNTERMINATED after indefinite response

Remote control error. Indicates that a query was received in the same program message after a query requesting an indefinite response was executed (see IEEE 488.2).

Rotary control not available

The front panel rotary control cannot be used to adjust the value of the parameter currently enabled for numeric input.

Settings conflict

Remote control error. Generic error indicating that an attempt has been made to make a change that is incompatible with the current instrument state. Usually errors of this sort are filtered by the MMI, but they can occur under remote control.

See the Remote Operating Manual for restrictions on command usage.

Source power calibration requires a detector type 6230A to be connected to input A

Source power calibration requires the use of a calibrated detector, i.e. an EEPROM model such as the 6230A.

Specified hard copy device driver not found

Remote control error. The hard copy device specified in a HARDcopy:DEVice:SELect command could not be found. The string specifying the device driver to load should be one of those returned by HARDcopy:DEVice:LIST?.

Step keys not available

The front panel step keys cannot be used to adjust the value of the parameter currently enabled for numeric input.

The detected source is different to the selected external source

The synthesizer on the remote interface does not match the currently selected synthesizer.

Select the correct external source.

The printer driver has timed out

Communication with the printer has timed out. (For example the printer cable has become disconnected or the printer is off line or out of paper.)

The printer driver is incompatible with the *<port>* port

The printer driver is incompatible with the specified port.

The printer is signaling Not Ready

The printer has returned a “not ready” error status. Check that it is not off-line or out of paper.

The selected printer driver cannot handle graphics

This error is generated when graphical output has been requested but the currently selected printer driver cannot output graphics.

The selected printer driver cannot handle text

This error is generated when text output has been requested but the currently selected printer driver cannot output text. (For example, a pen plotter would not be suitable for printing tabular data.)

Too many copies

Too many copies have been requested from the hard copy device.

Data warning

Block data error

Remote control error. General block data error that is reported if the instrument is unable to detect a more specific error.

Block data not allowed

Remote control error. A legal block data element was encountered but was not allowed by the instrument at this point.

Character data not allowed

Remote control error. Character data was received but is not allowed by the instrument at this point.

Command header error

Remote control error. An error was detected in the header. This error is displayed when the instrument cannot detect more specific errors.

Data out of range

Remote control error. A program data element was received that could not be executed because it was outside the range allowed by the instrument.

Delta marker not enabled

The [ENTER / =MKR] front panel key was used to try to set the value of the parameter currently enabled for numeric entry but the delta marker was not switched on.

Framing error in program message

Remote control error. A framing error was detected in the program message.

Check that the serial port speed settings for the instrument and the sending device match. To check the instrument's serial port settings use [UTILITY] *[Remote] [Set Up RS232]*.

Frequency limits for narrowband power calibration out of range

Remote control error. The upper and lower frequency limits supplied for a narrowband power calibration exceed the frequency range of the source.

GET (Group Execute Trigger) not allowed within a program message

Remote control error. A Group Execute Trigger was received within a program message which is not allowed.

Incorrect password

The password that has been entered is incorrect.

Input buffer overrun

Remote control error. An input buffer overrun has occurred while receiving from the serial controller.

Ensure that the flow control settings for the instrument and the sending device match. To check the instrument's flow control settings use [UTILITY] *[Remote] [Set Up RS232]*.

Invalid character

Remote control error. Indicates that a character (including a line feed or EOI terminators) in a remote control command has been found where it is not allowed.

Check the command for invalid characters. Ensure that the command has been properly terminated.

Invalid character data

Remote control error. Either the character data element is syntactically incorrect or the element received is not valid for the header.

Invalid character in number

Remote control error. An invalid character was found in a number.

Invalid date

An invalid date was entered. This could result from attempting to set the month to a number greater than 12, entering an invalid day for the month (for example February 31), or entering a year before 1980 or after 2099.

Invalid directory

Remote control error. A remote control command has specified an invalid directory.

Invalid drive specifier

Remote control error. A remote control command has included an invalid drive specifier (i.e. other than A: or C:).

Valid drives are A: or C:

Invalid expression

Remote control error. The expression data element was invalid.

Invalid separator

Remote control error. A separator character in a remote control command was expected but an illegal character was received. For example, the semicolon was omitted after a program message unit.

Invalid string data

Remote control error. Invalid string data was encountered. For example an END message was received before the terminating quote character.

Ensure that the string data is terminated correctly..

Invalid suffix

Remote control error. The suffix does not follow the correct syntax, or is invalid for this instrument, or is inappropriate in the current context (for example, setting the source start to 10 MHz when the source is set up for swept power measurements).

Invalid time

An invalid time was entered.

Missing parameter

Remote control error. Fewer parameters were received than required for the header.

Numeric data error

Remote control error. A problem has been detected with data that appears to be numeric. This error is displayed when the instrument is unable to detect more specific errors.

Numeric data not allowed

Remote control error. A legal numeric data element was received but the instrument does not accept one in this position.

Parameter not allowed

Remote control error. More parameters were received than required for the header.

Parity error in program message

Remote control error. A parity error was detected in the program message.

Password out of range

An out of range value was entered when attempting to set up a user-defined password. Valid ranges for passwords are:

Level 1: 1000 to 9999Level 2: 100000 to 999999
Security: 100000000 to 999999999

Passwords do not match

The value entered to confirm a password change was not the same as the value originally entered.

Program mnemonic too long

Remote control error. The header contains more than twelve characters.

Selection criteria match more than one database entry

Remote control error. The information supplied has matched more than one entry in the transmission line database.

The search criteria (manufacturer and/or transmission line type) must be narrowed to match a single entry.

Special form numeric parameter not allowed

Remote control error. A 'special form' numeric parameter (i.e. MINimum, MAXimum, UP, DOWN or MARKer) was received and was incompatible with the command.

String data not allowed

Remote control error. A string data element was encountered but was not allowed by the instrument at this point.

Stop is less than Start in segment *<segment number>*

The Stop value cannot be less than the Start value in a segment within a limit specification..

Suffix not allowed

Remote control error. A suffix was encountered after a numeric element that does not allow suffixes.

Suffix too long

Remote control error. The suffix contained more than twelve characters.

The supplied country string was not recognized

Remote control error. The country string supplied to a remote control command was not recognized.

Use SYSTem:ISETtings:COUNtry:LIST? to obtain a list of valid strings.

The supplied language string was not recognized

Remote control error. The language string supplied to a remote control command was not recognized.

Use SYSTem:ISETtings:LANGuage:LIST? to obtain a list of valid strings.

Undefined header

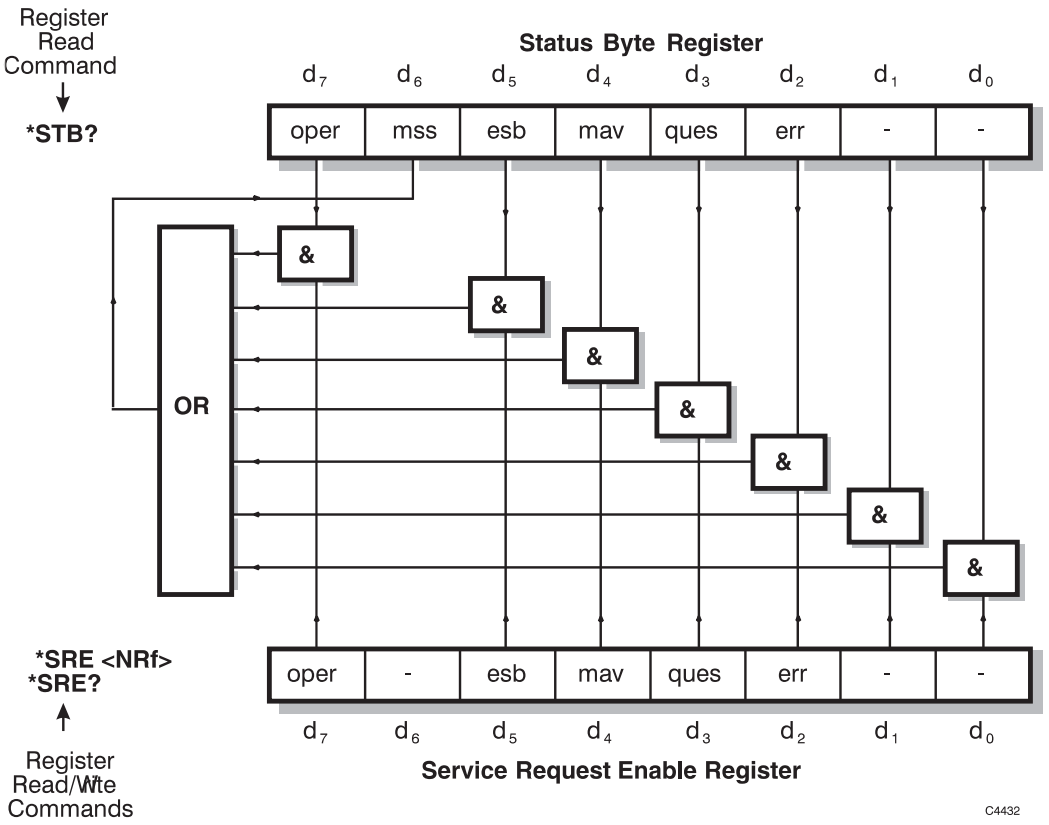
Remote control error. The header is syntactically correct, but is undefined for this instrument.

Upper limit is less than lower limit for *<position>* in segment *<number>*

Within a limit specification, a lower limit cannot be set higher than an upper limit.

Appendix C
GPIB STATUS REPORTING STRUCTURE

Status Byte when read by *STB

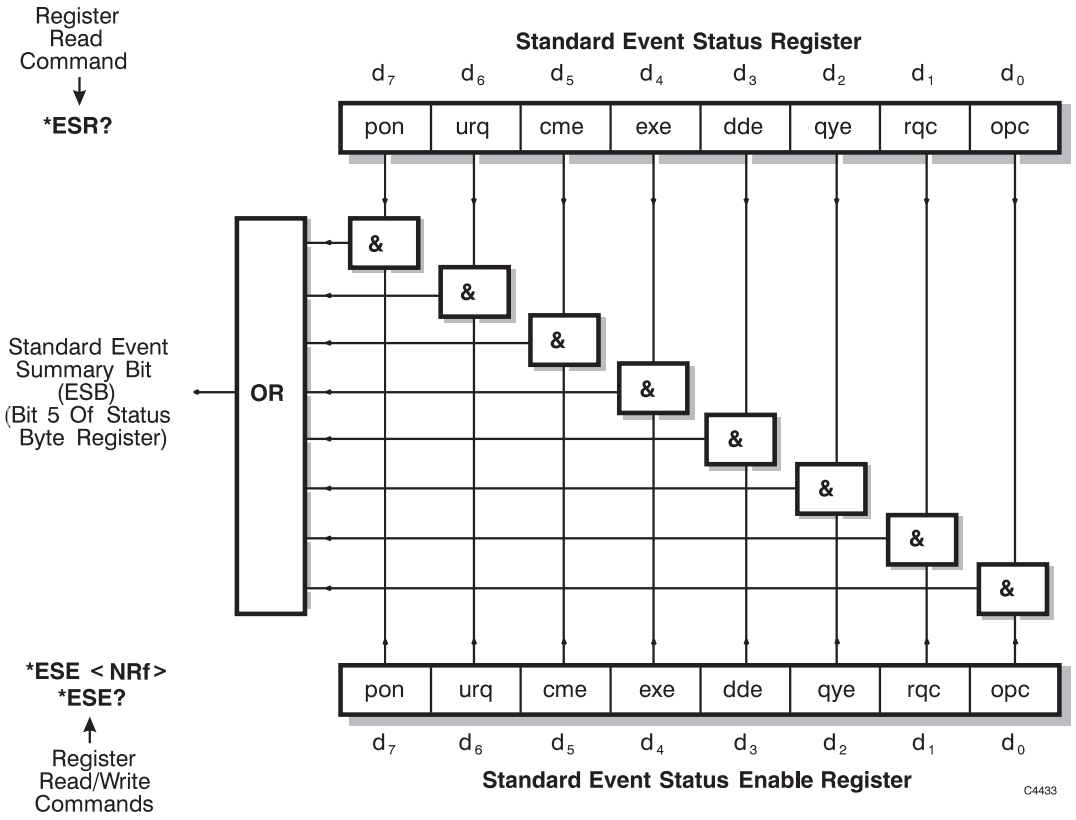


BIT	MNEM	DESCRIPTION
d_0	Not used	
d_1	Not used	
d_2	ERR	Error queue contains at least one error
d_3	QUES	Questionable Status Event Register Summary Bit
d_4	MAV	Message available in output queue (Queue not empty)
d_5	ESB	Standard Event Status Register Summary Bit
d_6	MSS	True when the device has at least one reason for requesting service
d_7	OPER	Operation Status Event Register Summary Bit

Note When read by Serial Poll (rather than *STB?), d_6 contains RQS (Request Service) as defined in IEEE 488.2.

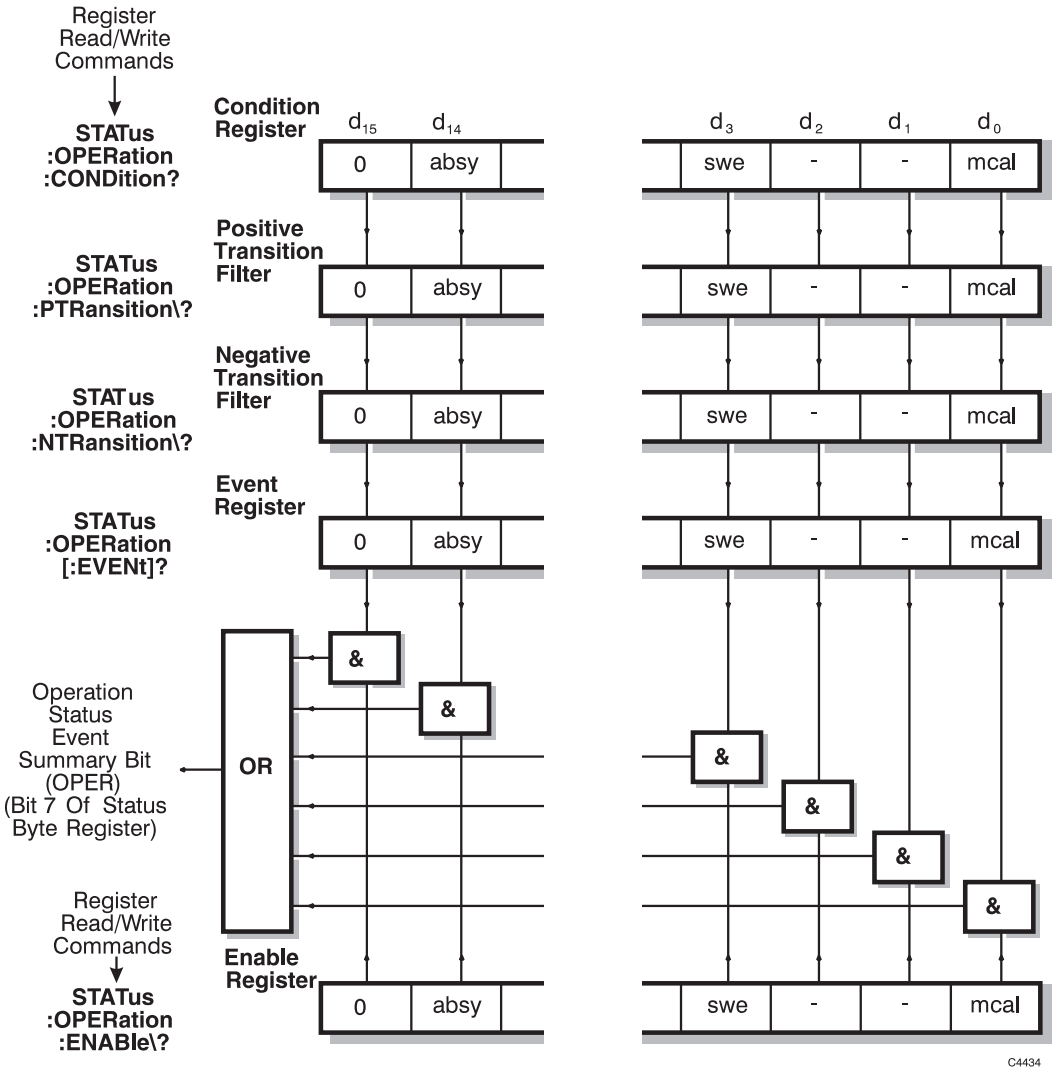
*SRE? always returns 0 for bit d_6.

Standard Event Status Register (as defined in IEEE 488.2)



BIT	MNEM	DESCRIPTION
d_0	OPC	Operation Complete
d_1	RQC	Request Control. The instrument is requesting permission to become the active IEEE 488 controller in charge
d_2	QYE	Query Error
d_3	DDE	Device-Specific Error
d_4	EXE	Execution Error
d_5	CME	Command Error
d_6	URQ	User Request - Not implemented in this instrument
d_7	PON	Power on

Operation Status Condition / Event / Enable Registers



BIT	MNEM	DEFAULT TRANSITION	DESCRIPTION
d_0			Not Used
d_1			Not Used
d_2			Not Used
d_3	SWE	NEG	Sweeping
d_4			Not Used
d_5	TRIG	POS	Waiting for Trigger
d_6			Not Used
d_7			Not Used
d_8			Not Used
d_9			Not Used
d_{10}			Not Used
d_{11}			Not Used
d_{12}			Not Used
d_{13}			Not Used
d_{14}			Not Used
d_{15}			Always zero

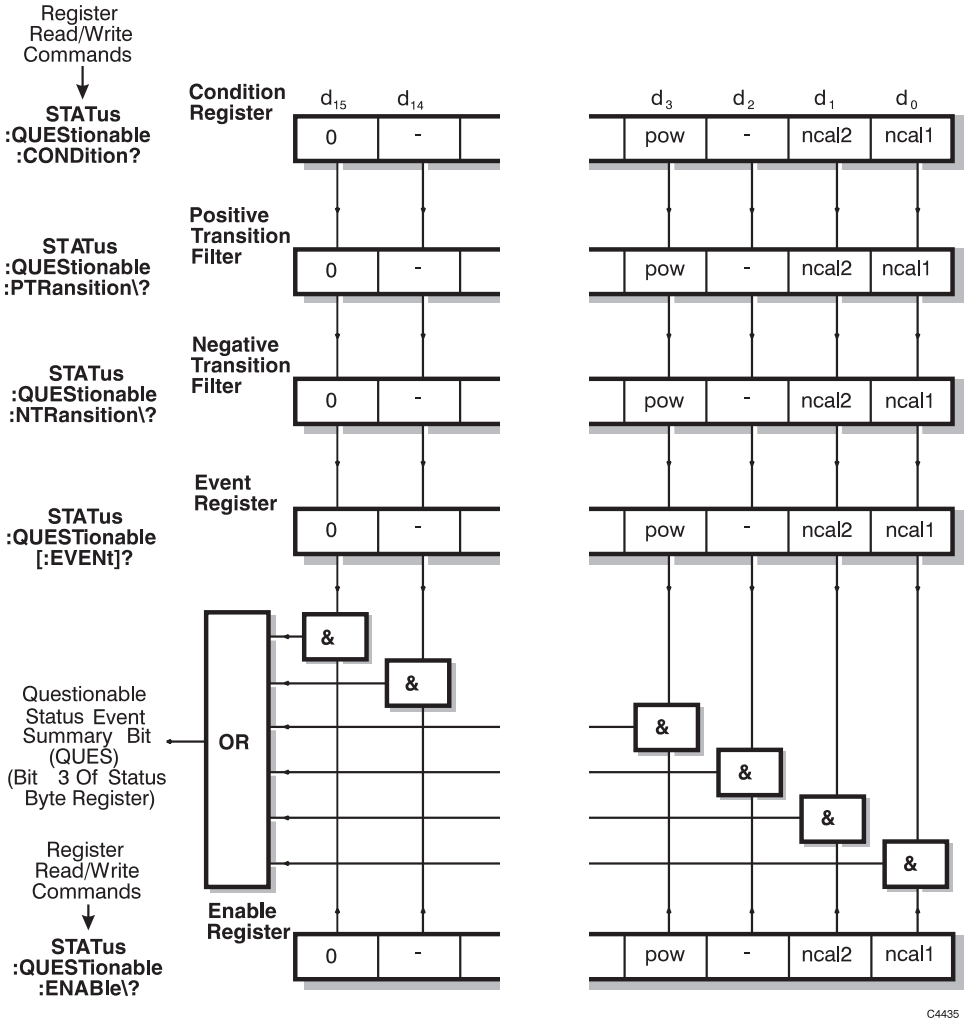
Notes

The default transitions listed above are those set at power on and when :SYSTem:PRESet is received. Note that the Operation Status Enable Register is cleared to all zeros at power on and on receipt of :SYSTem:PRESet so it is necessary to enable the appropriate bits before the summary bit in the status byte register will be enabled.

Each transition filter can be set independently giving four states:

Operation Status Event disabled
Operation Status Event set on positive transition in condition register
Operation Status Event set on negative transition in condition register
Operation Status Event set on positive or negative transitions in condition register

Questionable Status Condition / Event / Enable Registers



BIT	MNEM	DEFAULT TRANSITION	DESCRIPTION
d_0			Not Used
d_1			Not Used
d_2			Not Used
d_3	POW	POS	Source power unleveled
d_4	XSTD	POS	External standard not present or standard unlocked
d_5	FREQ	POS	Source unlocked
d_6			Not Used
d_7			Not Used
d_8	CAL	POS	Calibration failure
d_9			Not Used
d_{10}			Not Used
d_{11}			Not Used
d_{12}			Not Used
d_{13}			Not Used
d_{14}			Not Used
d_{15}			Always zero

Notes

The default transitions listed above are those set at power on and when :SYSTem:PRESet is received. Note that the Questionable Status Enable Register is cleared to all zeros at power on and on receipt of :SYSTem:PRESet so it is necessary to enable the appropriate bits before the summary bit in the status byte register will be enabled.

Calibration failure, bit d_8, indicates that calibration data for the internal frequency standard has been corrupted and the instrument is using default calibration data. The bit is reset when the calibration is valid again.

Appendix D
NUMERIC ENTRY HANDLING

All commands that take a NUMERIC VALUE must also accept the following special forms of numbers:

MINimum	Set the parameter to be the smallest value that can be settable for that parameter, i.e. the value nearest to negative infinity.
MAXimum	Set the parameter to be the largest value that can be settable for that parameter, i.e. the value nearest to positive infinity.
UP	Increment the value by the appropriate step value (defined using the :STEP subsystem).
DOWN	Decrement the value by the appropriate step value (defined using the :STEP subsystem).

Appendix E
PARAMETERS NOT AFFECTED BY PRESET

This Appendix lists which parameters are not affected by preset (i.e. *RST). All other parameters are defaulted on receipt of this command.

Serial baud rate	:SYST:SER:BAUD
Serial data bits	:SYST:SER:BITS
Serial stop bits	:SYST:SER:SBIT
Serial parity	:SYST:SER:PAR
Serial flow control	:SYST:SER:FCON
Instrument GPIB address	:SYST:ADDR
Display backlight brightness	:DISP:BLIG:VAL
Display backlight state	:DISP:BLIG
Display contrast	:DISP:CONT
Controller source (serial or IEEE488)	:SYST:CONT
Trigger type	:SYST:TRIG
Keyboard layout	:SYST:ISET:KEYB
Language	:SYST:ISET:LANG
Country	:SYST:ISET:COUN
Color palette	:DISP:CPAL
Source power calibration	:SOUR:CAL:SEL:PRI or :SOUR:CAL:SEL:USER
Date format	:SYST:ISET:DATE
Time format	:SYST:ISET:TIME
Field separator	:SYST:ISET:SEP
Decimal point character	:SYST:ISET:DPO

Appendix F
OVERLAPPED COMMANDS

All commands accepted by this instrument are sequential commands apart from those listed below:

SOUR:CAL:FM

SOUR:CAL:FREQ

SOUR:CAL:POW:BBAN

SOUR:CAL:POW:NBAN

SOUR:CAL:STAN

The only way of determining the end of the source calibration is by using *OPC, *OPC? or *WAI.

Appendix G
EMULATION OF IEEE488.1 ON THE SERIAL INTERFACE

Since the RS-232 interface does not have the extra control lines that the IEEE488.1 interface possesses, it is necessary to emulate the extra functionality. This is done using two mechanisms: the first is the break facility and the second is by sending specific control codes over the RS232 interface, which are interpreted to mean specific IEEE488.1 behavior.

This emulation of IEEE488.1 is only performed when the instrument is using the RS-232 interface to receive commands from an external controller.

Commands from controller to the instrument

There are four messages from the controller to the instrument:

Code sent	ASCII value	Meaning
break signal	N/A	Device clear
^H	8	Device trigger
^R	18	Change to lockout
^X	24	Perform serial poll

The break signal acts as a device clear at any time. Once the device clear has been actioned a reply (&DCL<cr><lf>) is returned. This is necessary because there is no concept of bus holdoff on RS-232.

The emulation codes are accepted at all times except within <ARBITRARY BLOCK PROGRAM DATA> or <STRING PROGRAM DATA> where the data is passed through unchanged.

The instrument will enter remote or remote with lockout states (from local or local with lockout states respectively) on receipt of a byte over the RS-232 interface.

Note that setting the Received Line Signal Detect line (pin 1 of 9-pin RS-232 connector) inactive will force the instrument back to local.

Responses/requests from the instrument to the controller

There are three messages from the instrument to the controller:

Code sent	Meaning
&SRQ<cr><lf>	Request service (asynchronous)
&ddd<cr><lf>	Reply to ^X - STB & RQS sent as three decimal digits (000 - 255)
&DCL<cr><lf>	Acknowledges device clear completion

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