RF POWER SENSORS
6900 Series

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CONTENTS

PREFACE

SYMBOLS IN THE MANUAL

The meaning of symbols used in this manual is as follows:-

(1) Sequence of steps in a procedure.

- List of topics or items

CAPS Capitals are used to identify names of controls and panel markings.

[ ] Square brackets are used to distinguish push-button keys.

PRECAUTIONS

WARNINGS, CAUTIONS and NOTES

These terms have specific meanings in this manual:

WARNINGS contain information to prevent personal injury.
CAUTIONS contain information to prevent damage to the equipment.
Notes contain important general information.

HAZARD SYMBOLS

The meaning of symbols that appear on the equipment is as follows:-

Symbol	Nature of hazard
	General hazards
	Dismantling may cause irreparable damage to this unit
	Static sensitive component

GENERAL CONDITIONS OF USE

This product is designed and tested to comply with the requirements of IEC/EN61010-1 ‘Safety requirements for electronic measuring apparatus’, for Class III hand-held equipment and is for use in a pollution degree 2 environment. The equipment is designed to operate from an installation Category I supply.

Equipment should be protected from the ingress of liquids and precipitation such as rain, snow, etc. When moving the instrument from a cold to a hot environment, it is important to allow the temperature of the instrument to stabilise before it is connected to the supply to avoid condensation forming. The instrument must only be operated within the environmental conditions specified in Chapter 1 ‘Performance Data’ in the Operating/Instruction manual.

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

DC supply voltage

This equipment conforms with IEC safety Class III, meaning that for continued safety it must only be connected to supplies and signal sources which conform to 'Separated Extra-Low Voltage' (SELV and SELV-E) voltage and insulation requirements. No hazardous voltages are generated internally. See under 'Performance Data' in Chapter 1 for the maximum permitted voltage levels that can be applied.

WARNING - TOXIC HAZARD

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 - TEMPERATURE HAZARD

When a 6930 Series sensor is used for measuring high powers the device has a high operating surface temperature.

CAUTION - STATIC SENSITIVE COMPONENTS

This equipment contains static-sensitive components which may be damaged by handling.

CAUTION - PRECISION CONNECTOR

All IFR Power Sensors are fitted with precision connectors. Good connector care is essential to maintain the performance of the Power Sensor. The following guidelines must always be adhered to when making connections:

- The connector interfaces must be clean and free of any mechanical damage.
- The connector should be measured with a connector gauge to ensure they are within mechanical tolerance.
- Connections should be made by rotating the outer locking nut only, NEVER the body of the device.
- Always use a torque spanner with 3.5 mm and 2.92 mm connectors.
- The Warranty does not cover connector damage due to mis-use or normal wear and tear.

PRECAUTIONS

WARNINGS, CAUTIONS et NOTES

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

WARNINGS contient des informations pour éviter toute blessure au personnel.
CAUTIONS contient des informations pour éviter les dommages aux équipements.
Notes contient d'importantes informations d'ordre général.

SYMBOLES SIGNALANT UN RISQUE

La signification des symboles liés à cet équipement est la suivante:

Symbole	Nature du risque
	Risques généraux
	Danger produits toxiques

CONDITIONS GENERALES D'UTILISATION

Ce produit a été conçu et testé pour être conforme aux exigences des normes CEI/IEN61010-1 « exigences de sécurité pour les appareils de mesure électroniques », pour des équipements Classe III qui tiennent dans la main 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 I.

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

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 - SECURITE ELECTRIQUE

Tension d'alimentation continue

Cet équipement est conforme aux normes de sécurité CEI classe III, c'est - à - dire qu'il ne doit être connecté qu'à des sources d'alimentation ou de signaux qui suivent les recommandations de tension et d'isolement du type 'Tension extra-faible séparée' (SELV at SELV-E). Aucune tension dangereuse n'est générée en interne. Le paragraphe 'Spécification du chapitre 1 précise les niveaux de tension maximum acceptables en entrée.

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 - DANGER DE CHALEUR

Lorsqu'une sonde de la série 6930 est utilisée pour la mesure de hautes puissances, sa température de fonctionnement est importante.

VORSICHTSMASSNAHMEN

WARNINGS, CAUTIONS und NOTES

Diese Hinweise haben eine bestimmte Bedeutung in diesem Handbuch:
WARNINGS dienen zur Vermeidung von Verletzungsrisiken.
CAUTIONS dienen dem Schutz der Geräte.
Notes enthalten wichtige Informationen.

GEFAHRENSYMBOLE

Die Gefahrensymbole auf den Geräten sind wie folgt:

Symbol	Gefahrenart
	Allgemeine Gefahr
	Warnung vor giftigen Substanzen

ALLGEMEINE HINWEISE ZUR VERWENDUNG

Dieses Produkt wurde entsprechend den Anforderungen von IEC/EN61010-1 "Sicherheitsanforderungen für elektronische Meßgeräte", Klasse III, für Betrieb in der Hand zur Verwendung in einer Grad 2 verunreinigten Umgebung, entwickelt und getestet. Dieses Gerät ist für Netzversorgung Klasse I zugelassen.

Das Meßgerät sollte vor dem Eindringen von Flüssigkeiten sowie vor Regen, Schnee etc. geschützt werden. Bei Standorteränderung von kalter in wärmere Umgebung sollte das Meßgerät wegen der Kondensation erst nach Anpassung an die wärmere Umgebung mit dem Netz verbunden werden. Das Meßgerät darf nur in Umgebungsbedingungen wie in Kapitel 1 "Leistungsdaten (Performance data)" der Bedienungsanleitung beschrieben, betrieben werden.

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

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

Gleichspannungsversorgung

Dieses Gerät entspricht der IEC Sicherheitsklasse III. Aus Sicherheitsgründen darf es nur an Netzgeräte und Signalquellen angeschlossen werden, die in Spannung und Isolation der SELV und SELV-E Richtlinie genügen (“Getrennte Niederspannung”). Im Gerät werden keine gefährlichen Spannungen erzeugt. Im Handbuch, Kapitel 1, “Performance Data” (Leistungsdaten), werden die anschließbaren Höchstspannungen definiert.

⚠ 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 - VORSICHT - HOHE TEMPERATUREN

Wird der Leistungsmeßkopf 6930 zur Messung von hoher Leistung verwendet, kann die Oberfläche des Meßkopfes heiß werden.

PRECAUZIONI

WARNINGS, CAUTIONS e NOTES

Questi termini vengono utilizzati in questo manuale con significati specifici:

WARNINGS riportano informazioni atte ad evitare possibili pericoli alla persona.
CAUTIONS riportano informazioni per evitare possibili pericoli all'apparec-chiatura.
Notes riportano importanti informazioni di carattere generale.

SIMBOLI DI PERICOLO

Significato dei simboli di pericolo utilizzati nell'apparato:

Simbolo	Tipo di pericolo
	Pericolo generico
	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 electronic measuring apparatus.' per apparati di classe III, palmari e per l'uso in un ambiente inquinato di grado 2. L'apparato è stato progettato per essere alimentato da un alimentatore di categoria I.

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.

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 a c.c.

Questo strumento rispetta le norme IEC, classe III, e quindi, per una completa sicurezza, deve essere collegato solo ad alimentatori e generatori di segnali che rispettano I requisiti di tensione ed isolamento SELV e SELV-E (Separated Extra-Low Voltage). Nessuna tensione pericolosa è generata al suo interno. Vedi capitolo 1 per quanto concerne I livelli massimi di tensione applicabili.

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 - PERICOLO ALTA TEMPERATURA

L'uso dei sensori della serie 6930 per la misura di alte potenze causa un forte innalzamento della temperatura della superficie esterna.

PRECAUCIONES

WARNINGS, CAUTIONS y NOTES

Estos términos tienen significados específicos en este manual:
WARNINGS contienen información referente a prevención de daños personales.
CAUATIONS contienen información referente a prevención de daños en equipos.
Notes contienen información general importante.

SÍMBOLOS DE PELIGRO

Los significados de los símbolos de peligro que aparecen en los equipos son los siguientes:

Símbolo	Naturaleza del peligro
	Peligro general
	Aviso de toxicidad

CONDICIONES GENERALES DE USO

Este producto ha sido diseñado y probado para cumplir los requerimientos de la normativa IEC/EN61010-1 "Requisitos de seguridad para aparatos electrónicos de medida", para equipos clase III, de mano 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 I.

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. Sólo debe utilizarse el aparato en las condiciones ambientales especificadas en el capítulo 1 "Especificaciones" o "Performance Data" del Manual de Instrucciones/Manual de Operación/Funcionamiento.

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 alimentación DC

Este equipo cumple con la norma de seguridad IEC clase III, lo que significa que para total seguridad debe ser conectado a alimentaciones y fuentes de señal que cumplan los requerimientos de tensión y aislamiento “Tensión Separada Extra-Baja” (SELV y SELV-E). Ninguna tensión generada internamente implica riesgo para el operario.

En el capítulo 1 “Especificaciones” podrá encontrar los valores máximos permitidos que pueden aplicarse.

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 - AVISO-RIESGO POR TEMPERATURA

Cuando se emplea un sensor de la serie 6930 para medir potencias elevadas, el dispositivo tiene una temperatura superficial alta.

Chapter 1
GENERAL INFORMATION

CONTENTS

FEATURES

The 6900 Series of RF Power Sensors is used with IFR 6960 Series RF Power Meter, the 6970 RF Power Meter, the CPM 20 and CPM 46 Counter Power Meter and the 6200 Series of Microwave Test Sets. Note, however, that the 6930 Series of sensors can be used with the 6960A and 6960B RF Power Meters, but cannot be used with the 6960 RF Power Meter. The sensors provide the meter with a chopped DC analogue of the RF power, and collectively they cover a power range from −70 dBm to +44 dBm (0.1 nW to 25 W) at frequencies from 30 kHz to 46 GHz.

Each sensor has an individual label showing a graph of 'calibration factor', and values of '50 MHz reference calibration factor' and 'linearity factor'. The calibration factor appropriate to the measurement frequency and the linearity factor may be entered into the instrument to enhance accuracy. The 6200 Series of Microwave Test Sets allow entry and storage of all the calibration data supplied with the sensors.

A 'calibration record' giving linearity factor and calibration data to two decimal places is also provided with each sensor.

VSWR and uncertainty values are low across the entire frequency range of the sensor.

Each sensor has a multi-way output connector for connection to the power meter via the sensor cable that is supplied with the meter. The sensor provides high level signals to the power meter so that the possibility of significant RF interference during measurements is negligible. A high damage level threshold minimizes the possibility of damage to the RF unit. Damaged units are, however, field replaceable in most cases (see Chapter 5).

Its small, light, rugged construction allows the sensor to be used confidently in bench or field applications without the need for any mechanical support.

PERFORMANCE DATA

The specifications for the sensors are shown on the following pages.

	6910	6911	6912
POWER RANGE	-30 dBm to +20 dBm (1 µW to 100 mW)	-30 dBm to +20 dBm (1 µW to 100 mW)	-30 dBm to +20 dBm (1 µW to 100 mW)
MAX RF INPUT	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs
FREQUENCY RANGE	10 MHz - 20 GHz	10 MHz - 20 GHz	30 kHz - 4.2 GHz
VSWR	1.25 10 MHz - 30 MHz 1.1 30 MHz - 2 GHz 1.18 2 GHz - 16 GHz 1.28 16 GHz - 18 GHz 1.4 typical 18 GHz - 20 GHz	1.25 10 MHz - 30 MHz 1.1 30 MHz - 2 GHz 1.18 2 GHz - 16 GHz 1.28 16 GHz - 18 GHz 1.4 typical 18 GHz - 20 GHz	1.6 30 kHz - 100 kHz 1.2 100 kHz - 300 kHz 1.1 300 kHz - 4.2 GHz
DRIFT	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	±0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	±0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	±0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range
CALIBRATION FACTOR Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male, 50 Ω	APC-7, 50 Ω	Precision N-type, male, 50 Ω
SIZE & WEIGHT	87 mm long, 33.5 mm dia. 140 g	87 mm long, 33.5 mm dia. 140 g	87 mm long, 33.5 mm dia. 140 g

	6913	6914	6914S
POWER RANGE	-30 dBm to +20 dBm (1 µW to 100 mW)	-30 dBm to +20 dBm (1 µW to 100 mW)	-30 dBm to +20 dBm (1 µW to 100 mW)
MAX RF INPUT	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs
FREQUENCY RANGE	10 MHz - 26.5 GHz	10 MHz - 40 GHz	10 MHz - 46 GHz
VSWR	1.4 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.1 100 MHz - 2 GHz 1.15 2 GHz - 12.4 GHz 1.2 12.4 GHz - 18 GHz 1.25 18 GHz - 26.5 GHz	1.58 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.1 100 MHz - 2 GHz 1.15 2 GHz - 12.4 GHz 1.2 12.4 GHz - 18 GHz 1.43 18 GHz - 40 GHz (1.55 for version –002)	1.58 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.1 100 MHz - 2 GHz 1.15 2 GHz - 12.4 GHz 1.43 12.4 GHz - 33 GHz 2.3 33 GHz - 40 GHz 3.6 40 GHz - 46 GHz
DRIFT	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	±0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	±0.5% at 100 mW, decreasing by 0.005% per mW	±0.5% at 100 mW, decreasing by 0.005% per mW
CALIBRATION FACTOR Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	MPC 3.5 mm, male, 50 Ω	MPC 2.92 mm, male, 50 Ω	MPC 2.92 mm, male, 50 Ω
SIZE & WEIGHT	80 mm long, 33.5 mm dia. 140 g	88.5 mm long, 33.5 mm dia. 140 g	88.5 mm long, 33.5 mm dia. 140 g

	6919	6920	6923
POWER RANGE	-30 dBm to +20 dBm (1 µW to 100 mW)	-70 dBm to -20 dBm* (0.1 nW to 10 µW)	-70 dBm to -20 dBm** (0.1 nW to 10 µW)
MAX RF INPUT	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 µs	+26 dBm (400 mW) CW +30 dBm (1 W) peak for 2 µs	+26 dBm (400 mW) CW +30 dBm (1 W) peak for 2 µs
FREQUENCY RANGE	30 kHz - 3 GHz	10 MHz - 20 GHz	10 MHz - 26.5 GHz
VSWR	1.4 30 kHz - 100 kHz 1.15 100 kHz - 300 kHz 1.1 300 kHz - 2 GHz 1.2 typical 2 GHz - 3 GHz	1.4 - 1.2 10 MHz - 40 MHz 1.2 40 MHz - 10 GHz 1.35 10 GHz - 18 GHz 1.4 typical 18 GHz - 20 GHz	1.4 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.12 100 MHz - 2 GHz 1.17 2 GHz - 8 GHz 1.3 8 GHz - 18 GHz 1.5 18 GHz - 26.5 GHz
DRIFT	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	20 pW (typical, 1 hr after 24 hr warm-up at constant temperature)	20 pW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	±0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	±1% at 25°C between -30 and -20 dBm Improves by a factor of 10 for each lower range	±1% at 25°C between -30 and -20 dBm Improves by a factor of 10 for each lower range
CALIBRATION FACTOR Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male, 75 Ω	Precision N-type, male, 50 Ω	MPC 3.5 mm, male, 50 Ω
SIZE & WEIGHT	89 mm long, 33.5 mm dia. 140 g	104 mm long, 33.5 mm dia. 180 g	87 mm long, 33.5 mm dia. 180 g

*Lower limit is -65 dBm when used with 6200 series MTS, and -60 dBm when used with the CPM 20/CPM 46

**Lower limit is –65 dBm when used with 6970,-60 dBm when used with the CPM 20/CPM 46 and –50 dBm when used with 6200 series MTS

	6924	6924S	6930
POWER RANGE	-70 dBm to -20 dBm* (0.1 nW to 10 µW)	-70 dBm to -20 dBm* (0.1 nW to 10 µW)	-15 dBm to +35 dBm (30 µW to 3 W)
MAX RF INPUT	+26 dBm (400 mW) CW +30 dBm (1 W) peak for 2 µs	+26 dBm (400 mW) CW +30 dBm (1 W) peak for 2 µs	+37 dBm (5 W) CW +50 dBm (100 W) peak for 2 µs
FREQUENCY RANGE	10 MHz - 40 GHz	10 MHz - 46 GHz	10 MHz - 18 GHz
VSWR	1.58 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.12 100 MHz - 2 GHz 1.33 2 GHz - 18 GHz 1.5 18 GHz - 33 GHz 1.95 33 GHz - 40 GHz 1.97 26.5 GHz - 40 GHz (-002 version)	1.58 10 MHz - 40 MHz 1.15 40 MHz - 100 MHz 1.12 100 MHz - 2 GHz 1.33 2 GHz - 18 GHz 1.5 18 GHz - 33 GHz 1.95 33 GHz - 40 GHz 3.6 40 GHz - 46 GHz	1.1 10 MHz - 2 GHz 1.18 2 GHz - 16 GHz 1.28 16 GHz - 18 GHz
DRIFT	20 pW (typical, 1 hr after 24 hr warm-up at constant temperature)	20 pW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	±1% between -30 and -20 dBm at 23°C	±1% between -30 and -20 dBm at 23°C	-2.5% to +3.5% with 6950 -1% to +5% between +25 and +35 dBm Improves by a factor of 10 for each lower range
CALIBRATION FACTOR			
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	MPC 2.92 mm, male, 50 Ω	MPC 2.92 mm, male, 50 Ω	Precision N-type, male, 50 Ω
SIZE & WEIGHT	88.5 mm long, 33.5 mm dia. 150 g	88.5 mm long, 33.5 mm dia. 150 g	93 mm long, 33.5 mm dia. 190 g

*Lower limit is -65 dBm when used with 6970, -60 dBm when used with the CPM 20/CPM 46 and –50 dBm when used with 6200 series MTS

	6932	6934	6934S
POWER RANGE	-15 dBm to +35 dBm (30 µW to 3 W)	-15 dBm to +30 dBm (30 µW to 1 W)	-15 dBm to +30 dBm (30 µW to 1 W)
MAX RF INPUT	+37 dBm (5 W) CW +50 dBm (100 W) peak for 2 µs	+33 dBm (2 W) CW +45 dBm (32 W) peak for 2 µs	+33 dBm (2 W) CW +45 dBm (32 W) peak for 2 µs
FREQUENCY RANGE	30 kHz - 4.2 GHz	10 MHz - 40 GHz	10 MHz - 46 GHz
VSWR	1.1 30 kHz - 4.2 GHz	1.12 10 MHz - 40 MHz 1.12 40 MHz - 100 MHz 1.1 100 MHz - 2 GHz 1.15 2 GHz - 12.4 GHz 1.2 12.4 GHz - 18 GHz 1.25 18 GHz - 26.5 GHz 1.43 26.5 GHz - 40 GHz (1.55 for version –002)	1.12 10 MHz - 40 MHz 1.12 40 MHz - 100 MHz 1.1 100 MHz - 2 GHz 1.15 2 GHz - 12.4 GHz 1.2 12.4 GHz - 18 GHz 1.25 18 GHz - 26.5 GHz 1.43 26.5 GHz - 40 GHz 2.3 40 GHz 46 GHz
DRIFT	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	-1% to +5% between +25 and +35 dBm. Improves by a factor of 10 for each lower range	-1% to +5% between +25 and +30 dBm, less on other ranges.	-1% to +5% between +25 and +30 dBm, less on other ranges.
CALIBRATION FACTOR Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male, 50 Ω	MPC 2.92 mm, male, 50 Ω	MPC 2.92 mm, male, 50 Ω
SIZE & WEIGHT	93 mm long, 33.5 mm dia. 190 g	87 mm long, 33.5 mm dia. 150 g	87 mm long, 33.5 mm dia. 150 g

	6930 (option 002)	6932 (option 002)
POWER RANGE	-5 dBm to +44 dBm (300 µW to 25 W)	-5 dBm to +44 dBm (300 µW to 25 W)
MAX RF INPUT	+45 dBm (30 W) CW +60 dBm (1 kW) peak for 2 µs	+45 dBm (30 W) CW +60 dBm (1 kW) peak for 2 µs
FREQUENCY RANGE	10 MHz - 18 GHz	30 kHz - 4.2 GHz
VSWR	1.2 10 MHz - 8 GHz 1.25 8 GHz - 12.4 GHz 1.35 12.4 GHz - 18 GHz	1.2 30 kHz - 4.2 GHz
DRIFT	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)	10 µW (typical, 1 hr after 24 hr warm-up at constant temperature)
LINEARITY FACTOR	Provided with sensor	Provided with sensor
Accuracy	–2% to +6% between +35 & +44 dBm. Improves by a factor of 10 for each lower range.	–2% to +6% between +35 & +44 dBm. Improves by a factor of 10 for each lower range.
CALIBRATION FACTOR Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%
RF CONNECTOR	Precision N-type, male, 50 Ω	Precision N-type, male, 50 Ω
SIZE & WEIGHT	228 mm long, 64 mm dia. 533 g	228 mm long, 64 mm dia. 533 g

Operating environment	This equipment is designed to comply with the requirements of HD401 / IEC348, for Class III Hand-Held equipment and is for use in a pollution degree 2 environment. The equipment is designed to operate from an installation category 1 supply.
Electro-magnetic compatibility	Conforms with the protection requirements of the EEC Council Directive 89/336/EEC. Conforms with the limits specified in the following standards: IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criterion B
Safety	Conforms with the requirements of EEC Council Directive 73/23/EEC and Standards IEC/EN 61010-1 : 1993. Conforms with the requirements of HD 401 / IEC 348
Normal range of operation	0°C to 55°C.
Condition of storage and transport	
Temperature	-40°C to +70°C.
Humidity	95% @ 35°C
Altitude	Up to 2500 m.

SUPPLIED ACCESSORIES

	Part No.
6913, 6914, 6914S	
N-type male / SMA female adapter (to connect to 0 dBm power reference)	23443/822
6919	
75 Ω to 50 Ω adapter (to connect to 0 dBm power reference)	23443/842
6920	
30 dB precision attenuator - for use in calibration Attenuation: 30 dB ±0.05 dB at 50 MHz at 25°C	06920/023
6923, 6924, 6924S	
30 dB precision attenuator - for use in calibration Attenuation: 30 dB ±0.05 dB at 50 MHz at 25°C	06920/023
N-type male / SMA female adapter to connect to 0 dBm power reference	23443/822
6934	
N-type male / SMA female adapter	23443/822

The 40 GHz and 46 GHz power sensors are supplied with accessories as above (001 versions). The 002 versions also include a waveguide 22 transformer and calibration table. A 002 version is not available for the 6914S, 6924S and 6934S.

The 6930 option 002 and 6932 option 002 are supplied with a high power attenuator to enable power levels up to 25 W to be measured.

OPTIONAL ACCESSORIES

The following items are required when using the 6920 and 6930 series sensors with the 6950 RF Power Meter. They are available from the Service Unit (address on rear cover of this manual).

6920 Series	
Range scale (-65 to -20 dBm) for attaching magnetically to the 6950 range control.	06920/008
6930 Series (not including option 002)	
Range scale (-10 to +35 dBm) for attaching magnetically to the 6950 range control.	41179/028

EC Declaration of Conformity

Certificate Ref. No.: EEA00109

The undersigned, representing:

Manufacturer:	**IFR Ltd.**
Address:	**Longacres House, Six Hills Way,** **Stevenage, Hertfordshire, U. K. SG1 2AN**

Herewith declares that the product:

Equipment Description:	RF Power Sensors
Model No.	6910, 6911, 6912, 6913, 6914, 6919, 6920, 6923, 6924, 6930, 6932, 6934 and 6914S, 6924S and 6934S.

is in conformity with the following EC directive(s)
(including all applicable amendments)

Reference No.	Title:
73/23/EEC	Low Voltage Directive
89/336/EEC	EMC Directive

and that the standards and/or technical specifications referenced below have been applied:

Safety:	EMC:	
IEC/EN 61010-1	IEC/EN 61326-1:1997	RF Emission Class B
		Immunity Table 1 and
		Performance Criterion B
Qualifying Notes:		

IFR Stevenage (Place) 5th June 2001 (Date)

(Signature)

Mike Scott - Quality Manager

Chapter 2
INSTALLATION

UNPACKING AND REPACKING

Retain the packing materials and the packing instruction note (if included) in case it is necessary to reship the sensor.

If the sensor is to be returned for servicing attach a label indicating the service required, type number, serial number and your return address.

If the original container or materials are not available use a strong double-wall carton packed with shock absorbing material around all sides of the sensor to hold it firmly.

Chapter 3
OPERATION

CONTENTS

PREPARATION FOR USE

Note...

The 6930 Series power sensors cannot be used with the 6960 RF Power Meter.

The 6930 Series option 002 sensors can only be used with the 6970 RF Power meter and CPM 20/CPM 46 Counter Power Meters.

Before making measurements, the power meter must be matched to the individual characteristics of the sensor. This entails the following procedures:

- Zeroing the meter.
- Calibration, that is, entering the sensor's calibration factor and linearity factor.

Note...

If the sensor has been stored at a temperature different from that of the measurement environment, allow sufficient time for thermal equilibrium to be established before zeroing or calibration. Avoid rapid temperature changes while operating.

WARNING

When using 6930 Series sensors, dissipation of the applied power can cause the sensor to have a high surface temperature. Take care when handling.

When using 6930 Series option 002 sensors, extra care is required because of very high surface temperatures.

CAUTION - EXCESSIVE TORQUE

Avoid applying excessive torque when tightening RF connectors or damage may occur. Finger-tight is usually sufficient, especially for type N connectors. If a torque wrench is used for 3.5 mm and 2.92 mm connectors, set it to break at 1 Nm (8 lb in).

CAUTION - AVOIDANCE OF MEASUREMENT ERRORS

To prevent stray radiation being detected and displayed on the power meter, the sensor should be properly terminated in 50 Ω (75 Ω for the 6919).

Before zeroing and operating the power meter, sufficient time should be allowed for the sensor to take up the ambient temperature of the measuring environment. Rapid temperature changes should be avoided while operating.

These precautions are particularly important when making low level power measurements using the 6920 series Power Sensors.

WITH 6950 POWER METER

Zeroing

(1) Connect the sensor to the SENSOR INPUT socket of the power meter using the sensor cable supplied with the power meter.

(2) With no power applied to the sensor, select the most sensitive range by turning the RANGE switch fully counter-clockwise.

(3) Adjust the ZERO control for zero reading on the meter, using the special tool provided with the power meter.

Hint...

It may be helpful in setting zero to adjust the RESPONSE TIME control on the rear panel to reduce noise. You may also find it easier to set zero first on a less sensitive range, as slight adjustments of the ZERO control have considerable effect on the most sensitive range.

Calibration

(1) Connect the sensor to the POWER REFERENCE output of the power meter.

For	6913/6914/6914S/6934	use N-type to SMA adapter
	6919	use the 75 Ω to 50 Ω adapter
	6920	use the 30 dB pad
	6923/6924	use the 30 dB pad and N-type to SMA adapter

(2) Attach the appropriate magnetic range scale to the skirt of the RANGE switch if required and set the switch to 0 dBm. The range scales are optional accessories (see page 1-9).

(3) Set the CAL FACTOR control to the value of the **reference calibration factor** given on the sensor label. Some sensors, e.g. the 6910, do not have this information on the label; in these cases the default value of 100% is assumed.

(4) On the rear panel, switch POWER REF to ON and the LIN F : 6%/8% switch to the setting which is nearest to the value of the **linearity factor** shown on the sensor label or its calibration data chart. (If the LIN F switch positions on your 6950 are designated 75 Ω and 50 Ω, these should be interpreted as 6% (75 Ω) and 8% (50 Ω) and the switch set accordingly as above.)

(5) Adjust the GAIN control for full-scale meter reading.

(6) Switch POWER REF off and disconnect the sensor from the POWER REFERENCE socket.

(7) Determine the **calibration factor** for the measurement frequency, whether from the graph on the sensor label or from its calibration data chart. Set the CAL FACTOR control to the same value.

The power meter can now be used for measuring RF power. For full instructions and uncertainty calculations, refer to the power meter Operating Manual, Chapter 3.

Linearity Factor Correction for 6920 Series Sensors

The linearity factor of 6920 Series sensors can vary from unit to unit. Since the 6950 has two preset linearity factor correction values, measurement errors will result when using 6920 Series sensors with a linearity factor that is significantly different from this value, and when the power level is above -30 dBm. If necessary, the displayed reading can be corrected to give a more accurate power measurement figure, as follows:

At -20 dBm, corrected reading = Displayed reading + Correction Factor
where Correction Factor = Sensor Lin Factor – 8%

For each 3 dB decrease in power level, this correction figure should be halved. At -30 dBm or lower the error will be negligible and the above correction is not necessary.

WITH 6960 SERIES POWER METER

Zeroing

(1) Connect the sensor to the SENSOR INPUT of the power meter, using the sensor cable supplied with the power meter.

(2) With no power applied to the sensor, press [AUTO ZERO]. Five dashes appear on the display, representing the power meter's five ranges. When the last of these disappears, all five ranges have been zeroed. This takes approximately 25 seconds.

Calibration

(1) Determine the **linearity factor**, either from the label on the sensor or from its calibration data chart. Press [LINEARITY FACTOR] and enter this value in the power meter.

(2) Connect the sensor to the POWER REFERENCE output of the power meter.

For	6913/6914/6934	use N-type to SMA adapter
	6919	use the 75 Ω to 50 Ω adapter
	6920	use the 30 dB pad
	6923/6924	use the 30 dB pad and N-type to SMA adapter

(3) Press [CAL FACTOR] and enter the value of the **reference calibration factor** given on the sensor label. Some sensors, e.g. the 6910, do not have this information on the label; in these cases the default value of 100% is assumed.

(4) Press [AUTO CAL]. Note that the POWER REFERENCE LED comes on and 'CAL' is displayed. The auto cal routine takes approximately 10 seconds for most sensors, the 6930 Series requiring about 45 seconds.

(5) When calibration is completed, you can check that it has been successful by pressing [POWER REF]. This switches the power reference signal on, and 0 dBm (1 mW) should be displayed.

(6) Press [POWER REF] again to switch off the power reference signal and disconnect the sensor from the POWER REFERENCE socket.

(7) Determine the **calibration factor** for the measurement frequency, either from the graph on the sensor label or from its calibration chart. Press [CAL FACTOR] and enter this value in the power meter.

The power meter can now be used for measuring RF power. For full instructions and uncertainty calculations, refer to the power meter Operating Manual, Chapter 3.

WITH 6970 POWER METER

Sensor Selection

(1) Press [ON/ENTER] to activate the instrument.

(2) Connect the sensor to the SENSOR INPUT of the power meter, using the sensor cable supplied with the power meter.

(3) Press [SENSOR] to display the list of possible sensor types. The 6930 Series option 002 are listed as Hi 6930 and Hi 6932. Press [ON/ENTER] to select sensor type.

Zeroing

(1) With no power applied to the sensor, press [SHIFT] [ZERO]. The display will be cleared and the peaking meter bar will progress across the display during the zeroing sequence. On completion the instrument will be restored to normal operation.

Calibration

(1) Determine the **linearity factor**, either from the label on the sensor or from its calibration data chart. Press [LIN FACTOR] and enter this value in the power meter.

Note...

For the best measurement accuracy, the sensor should be calibrated against the optional integral power reference, immediately following a sensor zero, as described in steps (2) to (5). An external power reference may be used if the power reference option is not fitted.

(2) Connect the sensor to the POWER REF output of the power meter

For 6913/6914/6914S/6934	use N-type to SMA adapter
6919	use the 75 Ω to 50 Ω adapter
6920	use the 30 dB pad
6923/6924	use the 30 dB pad and N-type to SMA adapter

Remove the 10 dB pad from the sensor before connection to POWER REF for 6930 Series option 002.

(3) Press [CAL FACTOR] and enter the value of the **reference calibration factor** given on the sensor label. Some sensors, e.g. the 6910, do not have this information on the label; in these cases the default value of 100% is assumed.

(4) When calibration is completed, you can check that it has been successful by pressing [SHIFT] [PWR. REF]. This switches the power reference signal on, and 0 dBm (1 mW) should be displayed.

(5) Press [SHIFT] [PWR. REF] again to switch off the power reference signal and disconnect the sensor from the POWER REF output.

For 6930 Series option 002 sensors connect the supplied 10 dB attenuator.

(6) Determine the **calibration factor** for the measurement frequency, either from the graph on the sensor label or from its calibration chart. Press [CAL FACTOR] and enter this value in the power meter.

The power meter can now be used for measuring RF power. For full instructions and uncertainty calculations, refer to the power meter Operating Manual, Chapter 3.

WITH CPM 20 / CPM 46 COUNTER POWER METER

Note...

Soft key titles are indicated by italics in square brackets.

(1) Press the power on/off key to activate the instrument.

(2) Connect the appropriate sensor to the SENSOR INPUT of the CPM, using the sensor cable supplied with the instrument.

(3) Press [SENSOR CAL] *[Lin Factor]* and enter the sensor **linearity factor**. This figure can be obtained from the label on the sensor or from the calibration data chart.

(4) While still within the Sensor Cal menu, press *[50 MHz CF]* and enter the sensor **reference calibration factor** (given on the sensor label).

(5) Connect the sensor to the POWER REFERENCE output of the CPM.

For 6920 Series sensors connect the supplied 30 dB attenuator between the power reference output and the sensor during calibration.

For 6930 Series Option 002 sensors the supplied 10 dB attenuator must be removed before connection to the power reference output and then reconnected to the sensor before subsequent measurements.

While within the Sensor Cal menu, press *[Cal]* to calibrate the sensor. The CPM performs a sensor zero followed by calibration. To check for a successful calibration, switch on the power reference with the sensor still connected; 0 dB (1 mW) should be displayed.

(6) Determine the calibration factor for the measurement frequency, either from the graph on the sensor label or from its calibration chart. Press [POWER METER] *[Cal Factor]* and enter this value.

The CPM can now be used for measuring RF power. However, when using 6920 Series sensors, perform an additional sensor zero by pressing [SENSOR CAL] *[Zero*] with no RF applied to the sensor.

For full instructions, refer to Chapter 3 of the CPM Operating Manual.

WITH 6200 SERIES OF MICROWAVE TEST SETS

For calibration instructions, refer to Chapter 3 of the 6200 Operating Manual.

Chapter 4
TECHNICAL DESCRIPTION

CONTENTS

LIST OF FIGURES

OVERALL CIRCUIT DESCRIPTION

Refer to Fig. 4-1. The RF sensor gives a small DC output voltage when RF power is applied. This DC voltage is converted to an AC signal by the signal chopper. The chopped signal is fed to the amplifier which is divided into two parts, the first part being in the power sensor and the other in the power meter. The signal is then processed by the power meter to give a power reading. A Zener diode in the power sensor provides sensor type information for the power meter.

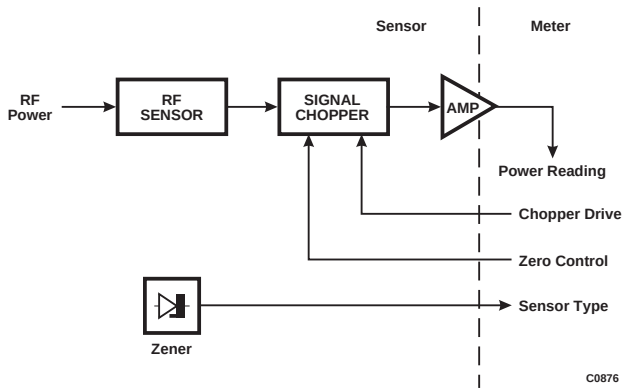

Fig. 4-1 Block Diagram of RF Power Sensor

DETAILED DESCRIPTION

Refer to Chapter 7 for the circuit diagram of the sensor.

RF Sensor

For the 6910 Series and 6930 Series sensors, the sensing element consists of a monolithic semiconductor thermocouple element. The 6920 Series uses a Schottky barrier diode. Both types of sensor provide an output voltage proportional to the RF power.

Signal chopper

The signal chopper consists of two field-effect transistors which act as a sampling gate. The sampling rate is controlled by a 925 Hz squarewave signal from the power meter. The output of the signal chopper is a 925 Hz square wave with amplitude proportional to the RF input power.

A zero control signal from the power meter is introduced at the input of the signal chopper. This allows the power meter to cancel any residual output that occurs with no RF power applied.

Amplifier

The amplifier is divided between the power sensor and the power meter. A simplified circuit is shown in Fig. 4-2.

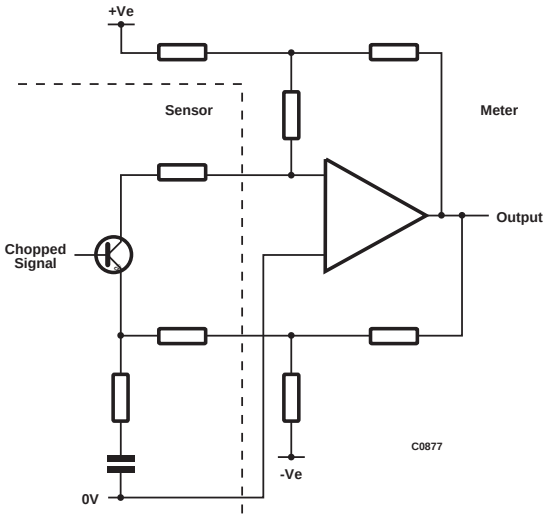

Fig. 4-2 Simplified Diagram of Amplifier

The amplifier has a gain of approximately 1000 and a band-pass characteristic centred at the sampling rate of 925 Hz. For a full description of the amplifier refer to the appropriate power meter Service Manual.

A Zener diode is mounted in the sensor to provide sensor type information for the power meters. The Zener voltage is detected by the power meter and indicates the type of sensor in use. This in turn defines the required scaling and linearity corrections that must be applied to give a true power reading.

Chapter 5
MAINTENANCE

CONTENTS

LIST OF FIGURES

6910 AND 6930 SERIES SENSORS

The following information does not apply to the 6914, 6914S, 6934, 6934S sensors. There is no provision for customer servicing of these sensors, and the complete unit must be returned to IFR Service Division for repair (address at rear of manual).

CAUTIONS

- It is important that the dismantling and re-assembling detailed in this chapter is performed in the order specified. This is because the gold wires which connect the RF assembly to the body assembly (see Fig. 5-1) are extremely delicate and may easily be damaged if over-stressed. For this reason also, care should be taken when measuring voltages across or in the vicinity of the gold wires.
- Ensure that all parts are free from dirt, grease or moisture as these might impair the performance of the sensor.

TEST EQUIPMENT

Description	Specification
6950, 6960 Series Power Meter, 6970 Power Meter or 6200 Series MTS (with sensor lead)	
Digital voltmeter	Resolution: 1 μV and 1 Ω.
Power supply	Capable of providing ±5 V DC.
Allen key	1.5 mm

SERVICING POLICY AND MAINTENANCE INFORMATION

For customer-servicing purposes, the sensor is considered in two parts (see Fig. 5-1).

The RF assembly. This is not customer-serviceable, but calibrated replacement RF assemblies may be quickly and easily fitted by the customer. See later in this chapter for testing and replacement instructions.

The body assembly. This contains the PCB assembly on which the FET chopper and part of the amplifier are mounted. The procedure for testing the chopper is given later in this chapter.

The chopper is not customer-serviceable but is available as a replacement part. The parts list in Chap. 6 and circuit diagram in Chap. 7 detail those components of the amplifier which are contained in the sensor. The remainder of the amplifier circuitry is in the power meter and limited fault-finding information for this circuit is contained in the Service Manuals for these instruments.

The complete sensor may, of course, be returned to IFR Service Division for repair and calibration (address at rear of manual).

FAULTY OPERATION

If the sensor is connected to a power meter and sensor lead which are known to be working, and either zeroing or calibration (as described in Chap. 3) cannot be successfully accomplished, then the sensor can be assumed to be faulty.

BASIC ACCESS

(1) Remove the sensor cable from the 12 pin connector on the sensor.

(2) Remove the rear plate retaining screws (item 1 and 2) using a 1.5 mm Allen key.

(3) Remove the rear plate and slide the casing from the sensor.

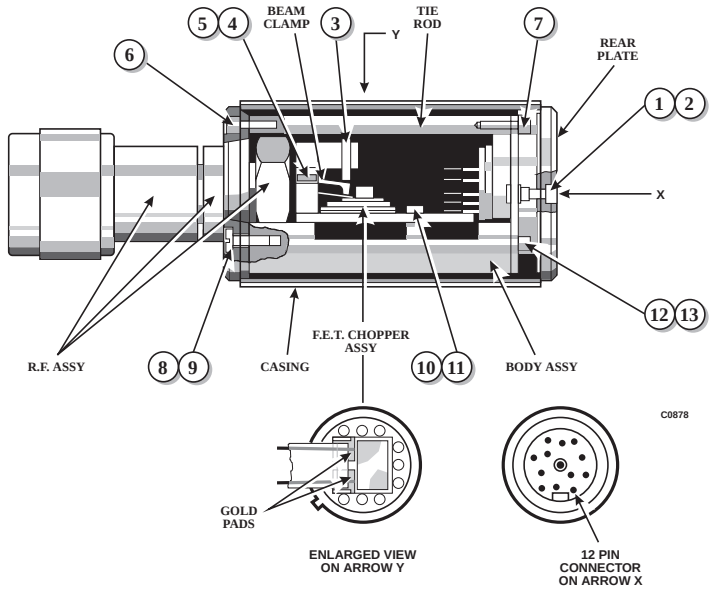

Fig. 5-1 Access and layout diagram - 6910 and 6930 Series Sensors

FAULT FINDING

Reconnect the sensor cable and power meter. Connect the input to the 1 mW 50 MHz reference output of the power meter. Switch on the reference signal.

Testing the RF Assembly

6910 Series sensors:

(1) Carefully measure the voltage across the gold pads on the FET chopper assembly (see inset, Fig. 5-1).

(2) If the voltage is 100 µV or greater, the RF assembly is functioning correctly. In this case, test the FET chopper assembly as described in the next section.

(3) If the voltage is less than 100 µV, remove the sensor from the 1 mW reference. Remove the tie rod by removing screws item 6 and item 7 with the Allen key.

Remove the beam clamp, by first loosening the clamp screw (item 3), then removing the beam clamp fixing screws (item 4 and 5). Remove the beam clamp and carefully lift the two gold wires from the RF assembly clear of the gold pads.

(4) Reconnect the sensor to the 1 mW reference signal and carefully measure the voltage across the gold wires. If the voltage is now greater than 100 µV, it can be concluded that there is a fault on the chopper/amplifier PCB or in the 12 pin connector. If the voltage is still less than 100 µV, the RF assembly is faulty and must be replaced as described in "Replacement of RF Assembly".

6930 Series sensors:

(1) Carefully measure the voltage across the gold pads on the FET chopper assembly (see inset, Fig. 5-1).

(2) If the voltage is 3 µV or greater, the RF assembly is functioning correctly. In this case, test the FET chopper assembly as described in the next section.

(3) If the voltage is less than 3 µV, remove the sensor from the 1 mW reference. Remove the tie rod by removing screws item 6 and item 7 with the Allen key.

Remove the beam clamp, by first loosening the clamp screw (item 3), then removing the beam clamp fixing screws (item 4 and 5). Remove the beam clamp and carefully lift the two gold wires from the RF assembly clear of the gold pads.

(4) Reconnect the sensor to the 1 mW reference signal and carefully measure the voltage across the gold wires. If the voltage is now greater than 3 µV, it can be concluded that there is a fault on the chopper/amplifier PCB or in the 12 pin connector. If the voltage is still less than 3 µV, the RF assembly is faulty and must be replaced as described in "Replacement of RF Assembly".

Testing the FET Chopper Assembly

(1) Disconnect the sensor from the 1 mW reference and remove the sensor cable. Remove the beam clamp as described in step (3) of "Testing the RF Assembly".

(2) Connect together sockets B, G and H of the 12 pin connector (see Fig. 5-1 inset) to turn both of the chopper's FETs on.

(3) Measure the resistance between the two gold pads. This should be approximately 100 - 200 Ω.

(4) Disconnect the link between sockets B/G and socket H Apply -5 V to socket H. This will turn off the shunt FET of the chopper. The resistance measured across the gold pads should now be greater than 10 kΩ.

(5) Disconnect the link between sockets B and G. Connect socket H to socket B and apply -5 V to socket G. This will turn off the series FET of the chopper. The resistance measured across the gold pads should be greater than 10 kΩ.

If the applied signals are getting through to the FET chopper but any of the above measurements are not achieved than the assembly is faulty and should be replaced as described in "Access to Chopper/Amplifier PCB".

SERVICING

Replacement of RF Assembly

(1) Dismantle the sensor as described in "Testing the RF assembly", step (3).

(2) Carefully remove the two RF assembly fixing screws (item 8 and 9) using a screwdriver. Carefully separate the RF assembly from the body assembly without damaging the gold wires.

(3) Offer the replacement RF assembly to the body assembly so that the fixing screw holes in the RF assembly flange match with those in the body assembly. Be careful not to damage the gold wires.

(4) Fit the fixing screws, items 8 and 9. Align the gold wires centrally over the gold pads on the chopper assembly.

(5) Ensure that the clamp screw (item 3) is not in contact with the lower part of the plastic clamp and fit the beam clamp in position using the fixing screws (item 4 and 5).

(6) Tighten the clamp screw (item 3) to firmly clamp the gold wires. The top of the clamp should just begin to bend upwards. If a torque screwdriver is available, tighten to 2 Ncm.

(7) Connect the partly assembled sensor to a power meter and check that zeroing and calibration can be successfully accomplished.

(8) Fit the tie rod in position using screws item 6 and item 7.

(9) Fit the casing and rear plate followed by the rear plate screws (item 1 and 2).

Access to Chopper/Amplifier PCB (PCB and 12 pin connector)

(1) Separate the RF assembly from the body assembly as described in steps (1) and (2) of "Replacement of RF Assembly".

(2) Remove the PCB fixing screws (items 10 and 11). Remove the 12 pin connector fixing screws (items 12 and 13). The PCB and 12 pin connector are now free of the body assembly.

(3) To replace the chopper/amplifier PCB and the 12 pin connector, reverse the above procedure.

6920 SENSORS

The following servicing information applies only to the 6920 sensor. There is no provision for customer servicing of the 6923, 6924 and 6924S sensors, and the complete unit must be returned to IFR Service Division for repair (address at rear of manual).

CAUTIONS

To avoid possible damage or degradation in performance:

- Take care when attaching/detaching leads to/from the RF assembly.
- Do not link any points unless specifically instructed.
- Ensure that all parts are free from dirt, grease or moisture.

TEST EQUIPMENT

Description	Specification
6950, 6960 Series Power Meter, 6970 Power Meter or 6200 Series MTS (with sensor lead)	
Digital voltmeter	Resolution: 1 mV.
Power supply	Capable of providing ±5 V DC.
Oscilloscope	Bandwidth: >20 kHz. Sensitivity: Better than 50 mV/div.
10 kΩ resistor	
Allen key	1.5 mm.

SERVICING POLICY AND MAINTENANCE INFORMATION

For servicing purposes, the sensor is considered in two parts (see Fig. 5-2).

The RF assembly. This is not customer-serviceable, but calibrated replacement RF assemblies may be quickly and easily fitted by the customer. See later in this chapter for testing and replacement instructions.

The body assembly. This contains the PCB on which is mounted part of the amplifier circuit. The remainder of this circuit is in the power meter and limited fault-finding information is contained in the Service Manuals for these instruments. Access to the PCB is described later in this chapter.

The complete sensor may, of course, be returned to IFR Service Division for repair and calibration (address at rear of manual).

FAULTY OPERATION

If the sensor is connected to a power meter and sensor lead which are known to be working, and either zeroing or calibration (as described in Chap. 3) cannot be successfully accomplished, then the sensor can be assumed to be faulty.

BASIC ACCESS

(1) Remove the sensor cable from the 12 pin connector on the sensor.

(2) Remove the rear plate retaining screws SC1 and SC2 using a 1.5 mm Allen key.

(3) Remove the rear plate and slide the casing from the sensor.

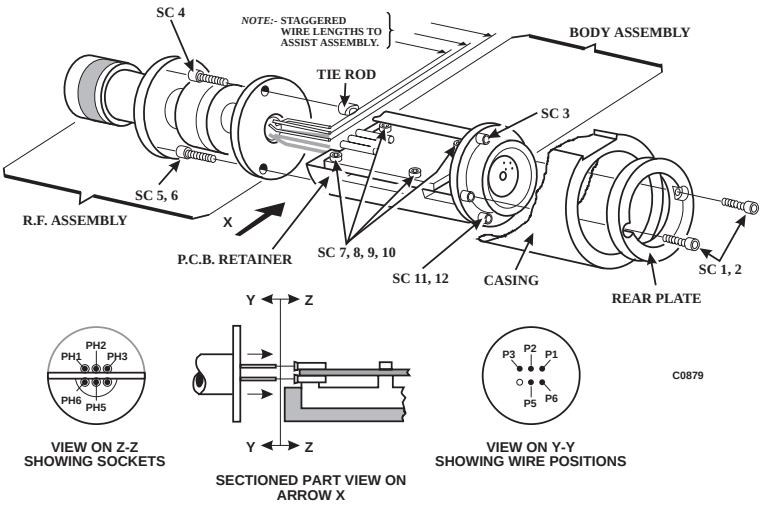

Fig. 5-2 Access and Layout Diagram - 6920 Sensor

FAULT FINDING

Testing the Body Assembly

(1) Reconnect the cable between the sensor and the power meter.

(2) Using the oscilloscope, check that the 925 Hz, 0 to -5 V square wave chopper drive signals are present on pin holders PH5 and PH6 (measure with respect to PCB retainer).

(3) If either signal is not present, then there is a fault in the body assembly (amplifier PCB or 12 pin connector).

Testing the RF Assembly

(1) Connect the sensor to the POWER REFERENCE output of the power meter. Switch the power reference on.

(2) Using the oscilloscope, carefully measure the voltage waveform between pin holder PH2 and the PCB retainer. This should be a 925 Hz, 0 to -200 mV (approximately) square wave. If not, a fault in the RF assembly is indicated. The remaining steps in this procedure will confirm or disprove this.

(3) Remove the RF assembly retaining screws SC4, 5 and 6 using the Allen key, and carefully pull the RF assembly away from the body assembly.

(4) Connect the RF assembly directly to the POWER REFERENCE output.

(5) Using the DC power supply, apply -5 V via a 10 kΩ resistor to pin P6 with the RF assembly chassis as earth (ground). Connect pin P5 to the chassis. Carefully attach a lead from the -ve terminal of the DVM to pin P1. Switch the POWER REFERENCE on and check that the reading is greater (more negative) than -200 mV. Reduce the DC supply to 0 V. The DVM reading should reduce to less than -60 mV.

(6) Switch the power reference off. Again using the DC power supply, apply -5 V via the 10 kΩ resistor to pin P5 with the RF assembly chassis as earth. Connect pin P6 to the chassis. Carefully attach a lead from the +ve terminal to pin P2. Switch the POWER REFERENCE on and check that the reading is greater (more negative) than -200 mV.

(7) If all of the measurements in steps (5) and (6) above are correct, then the RF assembly is not faulty. Check that corrections between RF assembly and body assembly are correct, and re-check that body assembly, sensor lead and power meter are functioning correctly. If any of the measurements in steps (5) and (6) are incorrect, then the RF assembly is faulty and must be replaced.

SERVICING

Replacement of RF Assembly

(1) Disconnect the RF assembly from the body assembly as described in "Basic Access" and "Testing the RF Assembly", step (3).

(2) In fitting the new RF assembly, ensure that the six pins protruding from the RF assembly are aligned correctly with the six pin holders in the body assembly. With the RF assembly on your right-hand side and the body assembly on your left (PCB uppermost), the longest pair of wires should be furthest away from you.

(3) Carefully insert the pins into the corresponding pin holders and check that the holes in the PCB retainer and tie rod correspond with those in the RF assembly flange. Gently push home.

(4) Replace screws SC4, 5 and 6. Note that SC4 (which connects to the tie rod) is narrower than the other two.

(5) Connect the partly assembled sensor to a power meter and check that it is functioning correctly.

Access to Body Assembly (PCB and 12 pin connector)

(1) Disconnect the RF assembly from the body assembly as described in "Basic Access" and "Testing the RF Assembly", step (3).

(2) Remove SC7, 8 9 and 10 to detach the PCB from its retainer.

(3) Remove SC11 and 12 to detach the 12 pin connector from the PCB retainer. Remove SC3 to detach the tie rod from the 12 pin connector, if required.

(4) To replace PCB and 12 pin connector, reverse the above procedure.

Chapter 6
REPLACEABLE PARTS

CONTENTS

COMPONENT VALUES

One or more of the components fitted in this instrument may differ from those listed in this chapter for any of the following reasons:

- Components indicated by a * have their values selected during test to achieve particular performance limits.
- Owing to supply difficulties, components of different value or type may be substituted provided the overall performance of the equipment is maintained.
- As part of a policy of continuous development, components may be changed in value or type to obtain detail improvements in performance.

When there is a difference between the component fitted and the one listed, always use as a replacement the same type and value as found in the instrument.

ORDERING

When ordering replacements, address the order to our Service Division (address on rear cover) or nearest agent and specify the following for each component required:

(1) Type and serial number of instrument.

(2) Circuit reference.

(3) Description.

(4) Part number.

Note...

The components on the Amplifier PCB are not recommended as replaceable parts but are listed for reference only.

6910

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/008
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/986
Amplifier PCB		
C1	CAPACITOR CERAMIC 0.01µF 20% 100V	26383/536
C2	CAPACITOR TANTALUM 4.7µF 20% 50V	26486/220
C3	CAPACITOR TANTALUM 4.7µF 20% 6.3V	26486/217
C4	CAPACITOR TANTALUM 1µF 20% 35V	26486/209
C5	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C6	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C7	CAPACITOR TANTALUM 2.2µF 20% 50V	26486/212
D1	ZENER BZX79C5V6	28371/417
R1	RESISTOR METAL-FILM 348K 0.5% 1/4W	24753/388
R2	RESISTOR METAL-FILM 330R 2% 1/8W	24772/061
R3	RESISTOR METAL-FILM 2K2 2% 1/8W	24772/081
R4	RESISTOR METAL-FILM 10K 2% 1/8W	24772/097
R5	THERMISTOR POSITIVE-TC 100R	6910/061
TR1	TRANSISTOR BC550B	28455/309
	FET CHOPPER ASSEMBLY	6910/004

6911

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/009
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/986
Amplifier PCB	As for 6910	

6912

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/010
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/987
Amplifier PCB		
C1	CAPACITOR CERAMIC 0.01µF 20% 100V	26383/536
C2	CAPACITOR TANTALUM 4.7µF 20% 50V	26486/220
C3	CAPACITOR TANTALUM 4.7µF 20% 6.3V	26486/217
C4	CAPACITOR TANTALUM 1µF 20% 35V	26486/209
C5	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C6	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C7	CAPACITOR TANTALUM 2.2µF 20% 50V	26486/212
D1	ZENER BZX79C6V8	28371/550
R1	RESISTOR METAL-FILM 348K 0.5% 1/4W	24753/388
R2	RESISTOR METAL-FILM 330R 2% 1/8W	24772/061
R3	RESISTOR METAL-FILM 2K2 2% 1/8W	24772/081
R4	RESISTOR METAL-FILM 10K 2% 1/8W	24772/097
R5	THERMISTOR POSITIVE-TC 100R	6910/061
TR1	TRANSISTOR BC550B	28455/309
	FET CHOPPER ASSEMBLY	6910/004

6913

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/011
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/986
Amplifier PCB	As for 6910	

6919

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/012
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/988
Amplifier PCB		
C1	CAPACITOR CERAMIC 0.01µF 20% 100V	26383/536
C2	CAPACITOR TANTALUM 3.3µF 20% 50V	26486/003
C3	CAPACITOR TANTALUM 4.7µF 20% 6.3V	26486/217
C4	CAPACITOR TANTALUM 1µF 20% 35V	26486/209
C5	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C6	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C7	CAPACITOR TANTALUM 2.2µF 20% 50V	26486/212
D1	ZENER BZX79C6V8	28371/550
R1	RESISTOR METAL-FILM 523K 0.5% 1/4W	24753/220
R2	RESISTOR METAL-FILM 330R 2% 1/8W	24772/061
R3	RESISTOR METAL-FILM 2K2 2% 1/8W	24772/081
R4	RESISTOR METAL-FILM 10K 2% 1/8W	24772/097
R5	THERMISTOR POSITIVE-TC 100R	6910/061
TR1	TRANSISTOR BC550B	28455/309
	FET CHOPPER ASSEMBLY	6910/004

6920

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/013
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/989
Amplifier PCB		
C3	CAPACITOR TANTALUM 1µF 20% 35V	26486/209
C4	CAPACITOR TANTALUM 4.7µF 20% 6.3V	26486/217
C5	CAPACITOR CERAMIC 10nF 20% 100V	26383/536
C6	CAPACITOR TANTALUM 10µF 20% 6.3V	26486/224
C7	CAPACITOR CERAMIC 47nF 10% 50V	26343/560
C9	CAPACITOR TANTALUM 220nF 20% 35V	26486/205
C14	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C15	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
D2	ZENER BZX79C2V7	28371/202
R1	RESISTOR METAL-FILM 30K 2% 1/8W	24772/108
R2	RESISTOR METAL-FILM 330R 2% 1/8W	24772/061
R3	RESISTOR METAL-FILM 2K 2% 1/8W	24772/080
R4	RESISTOR METAL-FILM 10K 2% 1/8W	24772/097
R5	RESISTOR METAL-FILM 47R 2% 1/8WR	24772/041
R6	RESISTOR METAL-FILM 68R 2% 1/8WR	24772/045
TR1	TRANSISTOR BC550B	28455/309

6930

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/014
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/990
Amplifier PCB		
C1	CAPACITOR CERAMIC 0.01µF 20% 100V	26383/536
C2	CAPACITOR TANTALUM 4.7µF 20% 50V	26486/220
C3	CAPACITOR TANTALUM 4.7µF 20% 6.3V	26486/217
C4	CAPACITOR TANTALUM 1µF 20% 35V	26486/209
C5	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C6	CAPACITOR CERAMIC 100pF 5% 50V	26386/824
C7	CAPACITOR TANTALUM 2.2µF 20% 50V	26486/212
D1	ZENER BZX79C8V2	28371/671
R1	RESISTOR METAL-FILM 348K 0.5% 1/4W	24753/388
R2	RESISTOR METAL-FILM 330R 2% 1/8W	24772/061
R3	RESISTOR METAL-FILM 2K2 2% 1/8W	24772/081
R4	RESISTOR METAL-FILM 10K 2% 1/8W	24772/097
R5	THERMISTOR POSITIVE-TC 100R	6910/061
TR1	TRANSISTOR BC550B	28455/309
	FET CHOPPER ASSEMBLY	6910/004

6932

Circuit Ref.	Description	Part No.
	Calibrated replacement RF assembly	44991/015
	Body assembly (includes amplifier PCB and connector assembly SK1)	44990/990
Amplifier PCB	As for 6930	

Chapter 7
SERVICING DIAGRAMS

CONTENTS

LIST OF FIGURES

COMPONENT VALUES

The letter in the component value code replaces the decimal point and indicates the multiplier and unit as follows:-

Resistors : Code letter R = ohms,
k = kilohms (10^3),
M = megohms (10^6).

Capacitors : Code letter m = millifarads (10^{-3}),
µ = microfarads (10^{-6}),
n = nanofarads (10^{-9}),
p = picofarads (10^{-12}).

Inductors : Code letter H = henrys,
m = millihenrys (10^{-3}),
µ = microhenrys (10^{-6}),
n = nanohenrys (10^{-9}).

* SIC : value selected during test, nominal value shown.

Components are marked normally with two, three or four figures according to the accuracy limit ±10%, ±1% or ±0.1%.