FLUKE®

9640A/9640A-LPNX

RF Reference Source

Getting Started Manual

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LIMITED WARRANTY AND LIMITATION OF LIABILITY

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one year and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

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To register your product online, visit http://register.fluke.com

LIMITES DE GARANTIE ET DE RESPONSABILITE

La société Fluke garantit l'absence de vices de matériaux et de fabrication de ses produits dans des conditions normales d'utilisation et d'entretien. La période de garantie est de un an et prend effet à la date d'expédition. Les pièces, les réparations de produit et les services sont garantis pendant une période de 90 jours. Cette garantie ne s'applique qu'à l'acheteur d'origine ou à l'utilisateur final s'il est client d'un distributeur agréé par Fluke, et ne s'applique pas aux fusibles, aux batteries/piles interchangeables ni à aucun produit qui, de l'avis de Fluke, a été malmené, modifié, négligé, contaminé ou endommagé par accident ou soumis à des conditions anormales d'utilisation et de manipulation. Fluke garantit que le logiciel fonctionnera en grande partie conformément à ses spécifications fonctionnelles pendant une période de 90 jours et qu'il a été correctement enregistré sur des supports non défectueux. Fluke ne garantit pas que le logiciel est exempt d'erreurs ou qu'il fonctionnera sans interruption.

Les distributeurs agréés par Fluke appliqueront cette garantie à des produits vendus neufs et qui n'ont pas servi, mais ne sont pas autorisés à offrir une garantie plus étendue ou différente au nom de Fluke. Le support de garantie est offert uniquement si le produit a été acquis par l'intermédiaire d'un point de vente agréé par Fluke ou bien si l'acheteur a payé le prix international applicable. Fluke se réserve le droit de facturer à l'acheteur les frais d'importation des pièces de réparation ou de remplacement si le produit acheté dans un pays a été expédié dans un autre pays pour y être réparé.

L'obligation de garantie de Fluke est limitée, au choix de Fluke, au remboursement du prix d'achat, ou à la réparation/remplacement gratuit d'un produit défectueux retourné dans le délai de garantie à un centre de service agréé par Fluke.

Pour avoir recours au service de la garantie, mettez-vous en rapport avec le centre de service agréé Fluke le plus proche pour recevoir les références d'autorisation de renvoi, ou envoyez le produit, accompagné d'une description du problème, port et assurance payés (franco lieu de destination), à ce centre de service. Fluke décline toute responsabilité en cas de dégradations survenues au cours du transport. Après la réparation sous garantie, le produit est renvoyé à l'acheteur, frais de port payés d'avance (franco lieu de destination). Si Fluke estime que le problème est le résultat d'une négligence, d'un traitement abusif, d'une contamination, d'une modification, d'un accident ou de conditions de fonctionnement ou de manipulation anormales, notamment de surtensions liées à une utilisation du produit en dehors des spécifications nominales, ou de l'usure normale des composants mécaniques, Fluke fournira un devis des frais de réparation et ne commencera la réparation qu'après en avoir reçu l'autorisation. Après la réparation, le produit est renvoyé à l'acheteur, en port payé (franco point d'expédition) et les frais de réparation et de transport lui sont facturés.

LA PRESENTE GARANTIE EST EXCLUSIVE ET TIENT LIEU DE TOUTES AUTRES GARANTIES, EXPRESSES OU IMPLICITES, Y COMPRIS, MAIS NON EXCLUSIVEMENT, TOUTE GARANTIE IMPLICITE DE VALEUR MARCHANDE OU D'ADEQUATION A UN USAGE PARTICULIER. FLUKE NE POURRA ETRE TENU RESPONSABLE D'AUCUN DOMMAGE PARTICULIER, INDIRECT, ACCIDENTEL OU CONSECUTIF, NI D'AUCUNS DEGATS OU PERTES, DE DONNEES NOTAMMENT, SUR UNE BASE CONTRACTUELLE, EXTRA-CONTRACTUELLE OU AUTRE.

Etant donné que certaines juridictions n'admettent pas les limitations d'une condition de garantie implicite, ni l'exclusion ou la limitation des dommages directs ou indirects, il se peut que les limitations et les exclusions de cette garantie ne s'appliquent pas à chaque acheteur. Si une disposition quelconque de cette garantie est jugée non valide ou inapplicable par un tribunal ou un autre pouvoir décisionnel compétent, une telle décision n'affectera en rien la validité ou le caractère exécutoire de toute autre disposition.

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Pour enregistrer votre produit en ligne, allez à http://register.fluke.com.

BESCHRÄNKTE GARANTIE UND HAFTUNGSBEGRENZUNG

Fluke gewährleistet, dass jedes Fluke-Produkt unter normalem Gebrauch und Service frei von Material- und Fertigungsdefekten ist. Die Garantiedauer beträgt 1 Jahr ab Lieferdatum. Ersatzteile, Produktreparaturen und Servicearbeiten haben eine Garantie von 90 Tagen. Diese Garantie wird ausschließlich dem Ersterwerber bzw. dem Endverbraucher, der das betreffende Produkt von einer von Fluke autorisierten Verkaufsstelle erworben hat, geleistet und erstreckt sich nicht auf Sicherungen, Einwegbatterien oder irgendwelche anderen Produkte, die nach dem Ermessen von Fluke unsachgemäß verwendet, verändert, vernachlässigt, verunreinigt, durch Unfälle beschädigt oder abnormalen Betriebsbedingungen oder einer unsachgemäßen Handhabung ausgesetzt wurden. Fluke garantiert für einen Zeitraum von 90 Tagen, dass die Software im Wesentlichen in Übereinstimmung mit den einschlägigen Funktionsbeschreibungen funktioniert und dass diese Software auf fehlerfreien Datenträgern gespeichert wurde. Fluke übernimmt jedoch keine Garantie dafür, dass die Software fehlerfrei ist und störungsfrei arbeitet.

Von Fluke autorisierte Verkaufsstellen dürfen diese Garantie ausschließlich für neue und nicht benutzte, an Endverbraucher verkaufte Produkte leisten. Die Verkaufsstellen sind jedoch nicht dazu berechtigt, diese Garantie im Namen von Fluke zu verlängern, auszudehnen oder in irgendeiner anderen Weise abzuändern. Der Käufer hat nur dann das Recht, aus der Garantie abgeleitete Unterstützungsleistungen in Anspruch zu nehmen, wenn das Produkt bei einer von Fluke autorisierten Vertriebsstelle erworben oder der jeweils geltende internationale Preis gezahlt wurde. Fluke behält sich das Recht vor, dem Käufer Einfuhrgebühren für Ersatzteile in Rechnung zu stellen, falls der Käufer das Produkt nicht in dem Land zur Reparatur einsendet, in dem er das Produkt ursprünglich erworben hat.

Die Garantieverpflichtung von Fluke beschränkt sich darauf, dass Fluke nach eigenem Ermessen den Kaufpreis ersetzt oder aber das defekte Produkt unentgeltlich repariert oder austauscht, wenn dieses Produkt innerhalb der Garantiefrist einem von Fluke autorisierten Servicezentrum zur Reparatur übergeben wird.

Um die Garantieleistung in Anspruch zu nehmen, wenden Sie sich bitte an das nächstgelegene von Fluke autorisierte Servicezentrum, um Rücknahmeinformationen zu erhalten, und senden Sie dann das Produkt mit einer Beschreibung des Problems und unter Vorauszahlung von Fracht- und Versicherungskosten (FOB-Bestimmungsort) an das nächstgelegene von Fluke autorisierte Servicezentrum. Fluke übernimmt keine Haftung für Transportschäden. Im Anschluss an die Reparatur wird das Produkt unter Vorauszahlung der Frachtkosten (Frachtfrei-Bestimmungsort) an den Käufer zurückgesandt. Wenn Fluke feststellt, dass der Defekt auf Vernachlässigung, unsachgemäße Handhabung, Verunreinigung, Veränderungen am Gerät, einen Unfall oder auf anormale Betriebsbedingungen, einschließlich durch außerhalb der für das Produkt spezifizierten Belastbarkeit verursachter Überspannungsfehler oder normaler Abnutzung mechanischer Komponenten, zurückzuführen ist, wird Fluke dem Erwerber einen Voranschlag der Reparaturkosten zukommen lassen und erst die Zustimmung des Erwerbers einholen, bevor die Arbeiten in Angriff genommen werden. Nach der Reparatur wird das Produkt unter Vorauszahlung der Frachtkosten an den Käufer zurückgeschickt, und es werden dem Käufer die Reparaturkosten und die Versandkosten (Frachtfrei-Versandort) in Rechnung gestellt.

DIE VORSTEHENDEN GARANTIEBESTIMMUNGEN STELLEN DEN EINZIGEN UND ALLEINIGEN RECHTSANSPRUCH AUF SCHADENERSATZ DES KÄUFERS DAR UND GELTEN AUSSCHLIESSLICH UND AN STELLE ALLER ANDEREN VERTRAGLICHEN ODER GESETZLICHEN GEWÄHRLEISTUNGSPFLICHTEN, EINSCHLIESSLICH - JEDOCH NICHT DARAUF BESCHRÄNKT - DER GESETZLICHEN GEWÄHRLEISTUNG DER MARKTFÄHIGKEIT UND DER EIGNUNG FÜR EINEN BESTIMMTEN ZWECK. FLUKE ÜBERNIMMT KEINE HAFTUNG FÜR SPEZIELLE, MITTELBARE, NEBEN- ODER FOLGESCHÄDEN ODER ABER VERLUSTE, EINSCHLIESSLICH DES VERLUSTS VON DATEN, UNABHÄNGIG VON DER URSACHE ODER THEORIE.

In einigen Ländern ist die Begrenzung einer gesetzlichen Gewährleistung und der Ausschluss oder die Begrenzung von Begleit- oder Folgeschäden nicht zulässig, sodass die oben genannten Einschränkungen und Ausschlüsse möglicherweise nicht für jeden Käufer gelten. Sollte eine Klausel dieser Garantiebestimmungen von einem zuständigen Gericht oder einer anderen Entscheidungsinstanz für unwirksam oder nicht durchsetzbar befunden werden, so bleiben die Wirksamkeit oder Durchsetzbarkeit anderer Klauseln dieser Garantiebestimmungen von einem solchen Spruch unberührt.

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Zur Registrierung der Software http://register.fluke.com besuchen.

GARANTÍA LIMITADA Y LIMITACIÓN DE RESPONSABILIDAD

Todo producto de Fluke está garantizado contra defectos en los materiales y en la mano de obra en condiciones normales de utilización y mantenimiento. El período de garantía es de un año a partir de la fecha de despacho. Las piezas de repuesto, reparaciones y servicios están garantizados por 90 días. Esta garantía se extiende sólo al comprador original o al cliente usuario final de un revendedor autorizado por Fluke y no es válida para fusibles, baterías desechables ni para ningún producto que, en opinión de Fluke, haya sido utilizado incorrectamente, modificado, maltratado, contaminado, o sufrido daño accidental o por condiciones anormales de funcionamiento o manipulación. Fluke garantiza que el software funcionará substancialmente de acuerdo con sus especificaciones funcionales durante 90 días y que ha sido grabado correctamente en un medio magnético sin defectos. Fluke no garantiza que el software no contenga errores ni que operará permanentemente.

Los revendedores autorizados por Fluke podrán extender esta garantía solamente a los Compradores finales de productos nuevos y sin uso previo, pero carecen de autoridad para extender una garantía mayor o diferente en nombre de Fluke. El soporte técnico en garantía está disponible sólo si el producto se compró a través de un centro de distribución autorizado por Fluke o si el comprador pagó el precio internacional correspondiente. Cuando un producto comprado en un país sea enviado a otro país para su reparación, Fluke se reserva el derecho de facturar al Comprador los gastos de importación de las reparaciones/repuestos.

La obligación de Fluke de acuerdo con la garantía está limitada, a elección de Fluke, al reembolso del precio de compra, la reparación gratuita o el reemplazo de un producto defectuoso que sea devuelto a un centro de servicio autorizado de Fluke dentro del período de garantía.

Para obtener servicio de garantía, póngase en contacto con el centro de servicio autorizado por Fluke más cercano para obtener la información correspondiente a la autorización de la devolución, después envíe el producto a ese centro de servicio, con una descripción del fallo, con los portes y seguro prepagados (FOB destino). Fluke no se hace responsable de los daños ocurridos durante el transporte. Después de la reparación de garantía, el producto se devolverá al Comprador con los fletes ya pagados (FOB destino). Si Fluke determina que el problema fue debido a negligencia, mala utilización, contaminación, modificación, accidente o una condición anormal de funcionamiento o manipulación, incluidas las fallas por sobretensión causadas por el uso fuera de los valores nominales especificados para el producto, o al desgaste normal de los componentes mecánicos, Fluke preparará una estimación de los costes de reparación y obtendrá la debida autorización antes de comenzar el trabajo. Al concluir la reparación, el producto se devolverá al Comprador con los fletes ya pagados, facturándosele la reparación y los gastos de transporte (FOB en el sitio de despacho).

ESTA GARANTÍA CONSTITUYE LA ÚNICA Y EXCLUSIVA COMPENSACIÓN DEL COMPRADOR Y SUBSTITUYE A TODAS LAS DEMÁS GARANTÍAS, EXPRESAS O IMPLÍCITAS, INCLUIDAS, ENTRE OTRAS, TODAS LAS GARANTÍAS IMPLÍCITAS DE COMERCIABILIDAD O IDONEIDAD PARA UN PROPÓSITO DETERMINADO. FLUKE NO SE RESPONSABILIZA DE PÉRDIDAS NI DAÑOS ESPECIALES, INDIRECTOS, IMPREVISTOS O CONTINGENTES, INCLUIDA LA PÉRDIDA DE DATOS, QUE SURJAN POR CUALQUIER TIPO DE CAUSA O TEORÍA.

Como algunos países o estados no permiten la limitación de la duración de una garantía implícita ni la exclusión ni limitación de los daños contingentes o resultantes, las limitaciones y exclusiones de esta garantía pueden no regir para todos los Compradores. Si una cláusula de esta Garantía es conceptuada no válida o inaplicable por un tribunal u otra instancia de jurisdicción competente, tal concepto no afectará la validez o aplicabilidad de cualquier otra cláusula.

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Para registrar su producto en línea, visite http://register.fluke.com.

保証および責任

Fluke の製品はすべて、通常の使用及びサービスの下で、材料および製造上の欠陥がないことを保証します。 保証期間は発送日から 1 年間です。 部品、製品の修理、またはサービスに関する保証期間は 90 日です。 この保証は、最初の購入者または Fluke 認定再販者のエンドユーザー･カスタマーにのみに限られます。 さらに、ヒューズ、使い捨て電池、または、使用上の間違いがあったり、変更されたり、無視されたり、汚染されたり、事故若しくは異常な動作や取り扱いによって損傷したと Fluke が認めた製品は保証の対象になりません。 Fluke は、ソフトウエアは実質的にその機能仕様通りに動作すること、また、本ソフトウエアは欠陥のないメディアに記録されていることを 90 日間保証します。 しかし、Fluke は、本ソフトウエアに欠陥がないことまたは中断なく動作することは保証しておりません。

Fluke 認定再販者は、新規品且つ未使用の製品に対しエンドユーザー･カスタマーにのみに本保証を行いますが、より大きな保証または異なった保証を Fluke の代わりに行う権限は持っていません。 製品が Fluke 認定販売店で購入されるか、または購入者が適当な国際価格を支払った場合に保証のサポートが受けられます。 ある国で購入された製品が修理のため他の国へ送られた場合、Fluke は購入者に、修理パーツ／交換パーツの輸入費用を請求する権利を保有します。

Fluke の保証義務は、Fluke の見解に従って、保証期間内に Fluke 認定サービス･センターへ返送された欠陥製品に対する購入価格の払い戻し、無料の修理、または交換に限られます。

保証サービスを受けるには、最寄りの Fluke 認定サービス･センターへご連絡いただき、返送の許可情報を入手してください。その後、問題個所の説明と共に製品を、送料および保険料前払い (FOB 目的地) で、最寄りの Fluke 認定サービス･センターへご返送ください。 Fluke は輸送中の損傷には責任を負いません。 保証による修理の後、製品は購入者に送料前払い(FOB 到着地)で返送されます。 当故障が、使用上の誤り、汚染、変更、事故、または操作や取り扱い上の異常な状況によって生じたと Fluke が判断した場合には、Fluke は修理費の見積りを提出し、承認を受けた後に修理を開始します。 修理の後、製品は、輸送費前払いで購入者に返送され、修理費および返送料 （FOB 発送地） の請求書が購入者に送られます。

本保証は購入者の唯一の救済手段であり、ある特定の目的に対する商品性または適合性に関する黙示の保証をすべて含むがそれのみに限定されない、明白なまたは黙示の他のすべての保証の代りになるものです。 データの紛失を含む、あらゆる原因に起因する、特殊な、間接的、偶然的または必然的損害または損失に関して、それが保証の不履行、または、契約、不法行為、信用、若しくは他のいかなる理論に基づいて発生したものであっても、Fluke は一切の責任を負いません。

ある国また州では、黙示の保証の期間に関する制限、または、偶然的若しくは必然的損害の除外または制限を認めていません。したがって、本保証の上記の制限および除外規定はある購入者には適用されない場合があります。 本保証の規定の一部が、管轄の裁判所またはその他の法的機関により無効または執行不能と見なされた場合においても、それは他の部分の規定の有効性または執行性に影響を与えません。

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製品の登録には、http://register.fluke.com をご利用ください。

有限担保和有限责任

Fluke 担保在正常使用和保养的情况下，其产品没有材料和工艺上的缺陷。担保期为从购买产品之日起的一年内。部件、产品修理和服务的担保期限为 90 天。本担保仅限于 Fluke 授权零售商的原购买人或最终用户，并且不适用于一次性电池、电缆接头、电缆绝缘转换接头或 Fluke 认为由于误用、改装、疏忽、污染及意外或异常操作或处理引起的任何产品损坏。Fluke 担保软件能依照功能规格正常运行 90 天，并且软件是记录在无缺陷的媒介上。Fluke 并不担保软件毫无错误或在运行中不会中断。

Fluke 授权的零售商应仅对最终用户就新的和未使用的产品提供本担保，但无权代表 Fluke 公司提供额外或不同的担保。只有通过 Fluke 授权的销售店购买的产品或者买方已经按适用的国际价格付款才能享受 Fluke 的担保支持。在一国购买的产品需在他国修理时，Fluke 有权向买方要求负担重大修理/零件更换费用。

Fluke 的担保为有限责任，由 Fluke 决定是否退还购买金额、免费修理或更换在担保期间退还 Fluke 授权服务中心的故障产品。

如需要保修服务，请与您就近的 Fluke 授权服务中心联系，获得退还授权信息；然后将产品寄至服务中心，并附上产品问题描述，同时预付运费和保险费（目的地离岸价格）。Fluke 不承担运送途中发生的损坏。在保修之后，产品将被寄回给买方并提前支付运输费（目的地交货）。如果 Fluke 认定产品故障是由于疏忽、误用、污染、修改、意外或不当操作或处理状况而产生，包括未在产品规定的额定值下使用引起的过压故障；或是由于机件日常使用损耗，则 Fluke 会估算修理费用，在获得买方同意后再进行修理。在修理之后，产品将被寄回给买方并预付运输费；买方将收到修理和返程运输费用（寄发地交货）的帐单。

本担保为买方唯一能获得的全部补偿内容，并且取代所有其它明示或隐含的担保，包括但不限于适销性或满足特殊目的任何隐含担保。FLUKE 对任何特殊、间接、偶发或后续的损坏或损失概不负责，包括由于任何原因或推理引起的数据丢失。

由于某些国家或州不允许对隐含担保的期限加以限制、或者排除和限制意外或后续损坏，本担保的限制和排除责任条款可能并不对每一个买方都适用。如果本担保的某些条款被法院或其它具有适当管辖权的裁决机构判定为无效或不可执行，则此类判决将不影响任何其它条款的有效性或可执行性。

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Chapter 1
Introduction and Specifications

About the Manual

This is the Getting Started for the 9640A/9640A-LPNX RF Reference Source (hereafter referred to as the Instrument or Product) and its options and accessories. It contains an overview of the information a user will need to operate and maintain the Instrument effectively. The manual is divided into the following chapters:

Chapter 1	Introduction and Specifications
Chapter 2	Preparing the Instrument for Operation
Chapter 3	Local Operation

For complete usage information, see the *9640A/9640A-LPNX Instruction Manual* located on the Product CD-ROM.

Safety Information

This section addresses safety considerations and describes symbols that may appear either in this manual or on the Product.

A **Warning** statement identifies conditions or practices that could result in injury or death.

A **Caution** statement identifies conditions or practices that could result in damage to the Product or equipment to which it is connected.

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, carefully read the information under *General Safety Summary* before attempting to install, use, or service the Product.

General Safety Summary

The Product has been designed and tested in accordance with the European standard publication EN 61010-1: 2001 and U.S. / Canadian standard publications UL 61010-1:2004 and CAN/CSA-C22.2 No.61010-1:2004. The Product left the factory in a safe condition.

This manual contains information and warnings that must be observed to keep the Product in a safe condition and ensure safe operation. Using or servicing the Product in conditions other than as specified in the *9640A/9640A-LPNX Instruction Manual* could compromise your safety.

To use the Product correctly and safely, read and follow the precautions on the next few pages, as well as, the safety instructions or warnings given throughout this manual. In addition, follow all generally accepted safety practices and procedures when working with and around electricity.

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury:

- **Use the product only as specified, or the protection supplied by the product can be compromised.**
- **Do not use the product around explosive gas, vapor, or in damp or wet environments.**
- **Inspect the Product before using it. Do not use the Product if it appears damaged.**
- **Do not use the product if it operates incorrectly. Protection may be impaired. If in doubt, have the Product serviced.**
- **Have the Product serviced only by qualified service personnel.**
- **Use only the mains power cord and connector approved for the voltage and plug configuration in your country and rated for the product.**
- **Connect an approved three-conductor mains power cord to a grounded power outlet.**
- **Do not operate the product with covers removed or the case open. Hazardous voltage exposure is possible.**
- **Do not touch voltages >30 V ac rms, 42 V ac peak, or 60 V dc.**
- **Use only specified replacement fuses.**
- **Use only specified replacement parts.**

⚠ Warning

To prevent personal injury, use good lifting practices when lifting or moving the Product. The Product is an unbalanced load and can weigh as much as 18 kg (40 pounds).

⚠ Warning

To prevent the transmission of an RF signal, never connect the Product output (the output from a 9640A-xx Leveling Head) to a radiating antenna or leaky transmission line of any kind. Such a transmission could be hazardous to personnel and may impair the SAFE operation of equipment, and communication and navigation systems.

The connection of a radiating antenna is an illegal act in many countries. Only connect the Product output (the output from a 9640A-xx Leveling Head) to equipment or transmission lines designed to prevent RF leakage at the level and frequency of the Product output.

Avoiding Product Damage

⚠ Caution

To prevent possible damage to the product or to equipment under test:

- **The front panel connectors on the Product are suited only for use with Fluke 9640A-xx Leveling Heads or the 9600FLT 1-GHz Wide Offset Filter. No other connection is permitted.**
- **The Leveling Heads are fitted with close tolerance metrology grade N-connectors compliant with MIL-C-39012 and MMC Standards for Precision N-connectors. When used in demanding metrology applications the Leveling Heads are likely to be mated with similar high-quality connectors, thus, minimizing the opportunity for wear and damage. However, in applications that require frequent mating or mating to lower quality connectors, the opportunity for damaging the connectors increases. On these high-risk occasions, consider using a sacrificial adapter to prevent damage to the N connectors.**
- **Improper mating of 50 Ω and 75 Ω connectors will irreversible damage the center pin. Although appearance is similar, the dimensions (pin diameter) of 75 Ω differ significantly from those of 50 Ω. Make sure that the 50 Ω Leveling Head is mated only to 50 Ω systems and, likewise, that the 75 Ω Leveling Head is mated only with 75 Ω systems. Otherwise, mechanical damage of metrology-grade connectors and out-of-tolerance performance is likely to occur.**
- **Very high-grade flexible coaxial transmission line conducts the RF input signal to 9640A-xx Leveling Heads. As with any coaxial line, deformation of sidewalls or abrupt bending can degrade performance. Take care to avoid mechanical stress or tight bend radius < 60 mm (2.4 in).**
- **Reliable and repeatable interconnections are achieved only at specified torque settings. Performance will be impaired if torque settings are not observed, and permanent connector damage is likely to result from over-tightening.**
- **Critical connector mating dimensions could be damaged during disassembly of a Leveling Head. DO NOT TAMPER with the four mounting screws at the base of the N-Connector. Leveling Head disassembly should only be performed by qualified service personnel at a Fluke Service Center.**
- **To prevent damage to the product, do not use aromatic hydrocarbons or chlorinated solvents for cleaning.**

Symbols

The following safety and electrical symbols may appear on the Product or in this manual.

⚠	Risk of danger. Important information. See manual.	⏚	Earth ground.
⚠	Hazardous voltage. Voltage > 30 V dc or ac peak might be present	⏚	Protective conductor terminal
~	AC (Alternating Current).	⊣⊢	Capacitance.
⎓	DC (Direct Current).	⏩	Diode.
≂ or ≂ ⎓	AC or DC (Alternating or Direct Current)	▭	Fuse.
		CAT	IEC 61010 Overvoltage (installation or measurement) Category.
ϟ	Potentially hazardous voltage.	♻	Recycle.
⚠	Static awareness. Static discharge can damage part(s).	🗑	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.
⏻	Power ON / OFF		

Instrument Description

The Instrument is an RF Reference Source designed to create the signals needed for precision RF and microwave applications. See Figure 1-1. Signal delivery via interchangeable Leveling Heads ensures a unique combination of level accuracy, dynamic range, and frequency coverage in both 50 Ω and 75 Ω systems.

The following is a list of the features that enable the Instrument to be readily integrated into a typical RF calibration system:

- Accurate level / attenuation over a wide dynamic range
- Precision internal AM/FM modulation, including External Modulation capability
- Frequency Range includes LF, and RF
- High signal purity with no additional filtering
- Passive Leveling Heads to ensure direct and precise signal delivery to the load
- Low Phase Noise – two performance levels in the 9640A and 9640A-LPNX instruments
- Integrated 50 MHz Frequency Counter
- IEEE 488 Remote Interface
- Remote command emulation of legacy signal generators (optional)
- Rack Mount Slide Kit (optional)
- 1 GHz Wide Offsett Phase Noise Filter (optional)

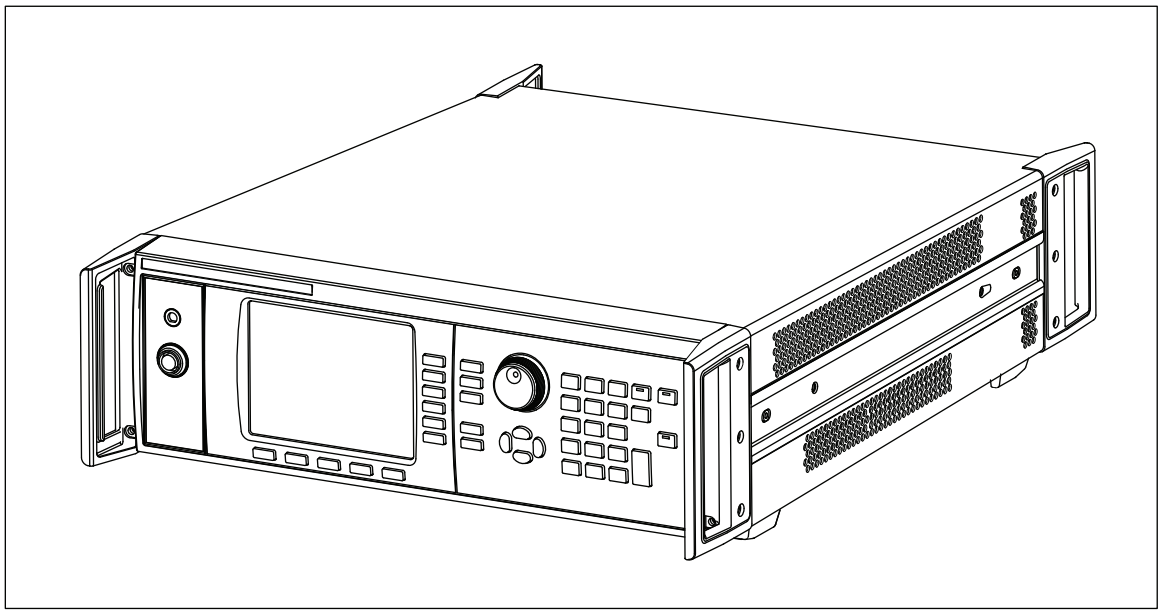

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Figure 1-1. 9640A RF Reference Source

Options and Accessories

Table 1-1 provides a list of the instruments, options and accessories available. When ordering an option or accessory after the original purchase, include a reference to the Instrument as well as the description from the following table.

Table 1-1. List of Options and Accessories

Instruments	
9640A-STD	9640A 4 GHz RF Reference Source with 50 Ω Leveling Head (GPIB Command Emulation of HP3335 included)
9640A-LPNX	9640A 4 GHz Low Phase Noise RF Reference Source with 50 Ω Leveling Head (GPIB Command Emulation of HP3335 included)
Options	
9600FC	Integrated 50 MHz Frequency Counter (License code user-enabled without service return)
9640A-xxx/75 9640A/75UPG [1]	Above supplied with or upgrade to add a 9640A-75 75 Ω Leveling Head
8662/8663 GPIB [2]	HP8662A / HP8663A GPIB command emulation (License code user-enabled without service return)

Accessories	
Y9600	Rack Mount Slide Kit
9600CASE	Rugged Transit Case
9600CONN	RF Interconnect Kit. The kit includes: 1 – Sacrificial N-Connector, Male to Female Adapter, 50 Ω 1 – Precision N-Connector, Female to Female Adapter, 50 Ω 2 – RF Connector Torque Wrenches
9600FLT	1GHz Wide Offset Phase Noise Filter (Instrument Mounting Kit included)
9640A/9640A-LPNX Manual Set	9640A/9640A-LPNX Instruction Manual Package. The package includes: 1 – Printed Getting Started Manual 1 – CD containing the entire manual set (PDF files), including: 1 – 9640A/9640A-LPNX Instruction Manual 2 – 9640A/9640A-LPNX Getting Started Manuals (English and French) 1 – Tables of 9640A Calibration Points to assist automation of 9640A adjustment

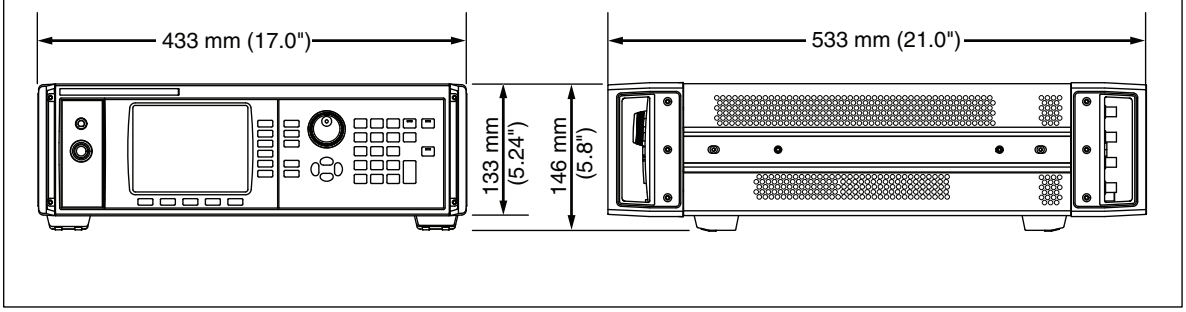
[1] This is a factory/service upgrade that requires the return of the main unit and all of the partner Leveling Heads
[2] This option is provided for a trial period, therafter requires the purchase and entry of a licence key

Specifications

The following section lists the general specifications. For a complete set of specifications, refer to the *9640A/9640A-LPNX Instruction Manual* supplied on the product CD-Rom. The most current versions of these documents are available at http://www.fluke.com (Support > Manuals).

General Specifications

Performance	All specifications apply to a 1 year calibration interval at an ambient temperature of Tcal ±5 °C. Nominal factory Tcal calibration temperature 23 °C. Applicable to instruments fitted with firmware Issue 3 or later.
Standard Interfaces	IEEE488.2 (GPIB)
Warmup Time	60 minutes
Temperature	Operating: 0 °C to 50 °C Specified Operation: 5 °C to 40 °C Storage: -20 °C to +70 °C
Relative Humidity	Operating or Storage: Non-condensing, 5 °C to 30 °C <95 %, <40 °C <75 %, <50 °C <45 %
Altitude	Operating: ≤2,000 m Non-operating: ≤12,000 m
Safety	EN 61010-1:2001, CAN/CSA 22.2 No. 61010-1:2004 and UL 61010-1:2004, indoor use only, pollution degree 2, installation category II.
EMC	EN 61326:2006 Class B.
Line Power	Rating: 115 V/ 230 V nominal [1]
Power Consumption	≤250 VA
Dimensions	433 mm (17.0 in) wide, 146 mm (5.8 in) high and 533 mm (21.0 in) deep. Mounts within industry-standard 483 mm (19 in) rack-mount frames when fitted with Y9600 rack mounting kit.
Weight	18 kg (40 lb)
[1] Type tested for operation and functionality 90 to 132 V rms and 180 to 264 V rms at 47 to 63 Hz.	



9640A Dimensions

Chapter 2
Preparing the Instrument for Operation

Introduction

This chapter contains instructions for unpacking the Instrument and preparing it for operation. Many of the procedures in this chapter are also useful for performing general maintenance on the Instrument. They include the following:

- Changing line voltage (115 V ac to 230 V ac)
- Replacing the line-power fuse
- Connecting and powering the Instrument
- Cleaning and storing the Instrument

Contacting Fluke

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-3434-0181
- Singapore: +65-738-5655
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit http://register.fluke.com.

To see, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

Unpacking and Inspection

⚠ Warning

To prevent personal injury, use good lifting practices when lifting or moving the Product. The Product is an unbalanced load and can weigh as much as 18 kg (40 pounds).

Fluke has taken great care to ensure that the Instrument arrives in perfect condition. When the Instrument arrives, carefully unpack and inspect for external damage to the case, front panel, and rear panel. If the Instrument has been subject to rough handling in transit, there may be evidence of external damage to the shipping carton. Check also to make sure all standard items listed in Table 2-1 are present.

If the Instrument or the shipping container have been damaged, notify the carrier immediately. Report any shortages to the place of purchase or to the nearest Fluke Technical Service Center.

If the shipping container and the packing material are undamaged, save them for use as a future storage/shipping container for the Instrument.

Table 2-1. List of Contents

Description	Quantity
9640A RF Reference Source	1
9640A-50 Leveling Head	1
9640A-75 Leveling Head	Optional
Carrying/Storage Case (for two Leveling Heads and the 9600CONN RF Interconnect Kit)	1
9600FLT 1GHz Wide Offset Phase Noise Filter and Mounting Kit	Optional
9640A Getting Started Manual, English	1
CD ROM – Manual Set	1
Line Cord	1
Certificate of Calibration	1
Y9600 Rack Mount Slide Kit	Optional
9600CASE Rugedized Transit Case (ships separately)	Optional
9600CONN RF Interconnect Kit (Sacrificial N-Adapter and N/PC3.5 Torque Wrench Kit)	Optional

Storing and Shipping the Instrument

To store the Instrument, place it inside a sealed plastic bag and then place the bagged unit inside the cushioning material inside the original shipping container. Close and secure the container. This container is the most suitable storage receptacle for the Instrument because it provides the necessary shock isolation during normal handling. Store the boxed Instrument in a location that complies with the storage environment specification. See Chapter 1.

Whenever it is necessary to ship the Instrument, use the original shipping container if possible. Pack and secure the Instrument as described in the previous paragraph. If you must substitute for the original container, choose a substitute that will provide shock isolation comparable to the original container. Recommended dimensions for a substitute cushioned container are given in Table 2-2.

Table 2-2. Dimensions for a Substitute Cushioned Shipping Container

Container	Length	Width	Depth
Box	720 mm (28.5 in)	570 mm (22.5 in)	360 mm (14.2 in)
Corner Cushions	> 60 mm (2.4 in) depth of expanded polyethylene (35 kg/m^3) at the instrument corners.		

Power Considerations

The Instrument ships from the factory configured to match the requirements of your local ac line power. If the Instrument is relocated to another region it may need to be reconfigured to match the ac line power of the new location. Three things affect the configuration:

- Power cord (See Table 2-3.)
- Line-power fuse (See Table 2-4 and Figure 2-1.)
- Rear-panel switch setting (115-230, see Table 2-3 and Figure 2-1.)

The following paragraphs describe how to make the changes for a new voltage configuration. They are also useful to verify that the Instrument's current power configuration is correct.

Replacing the Power Cord

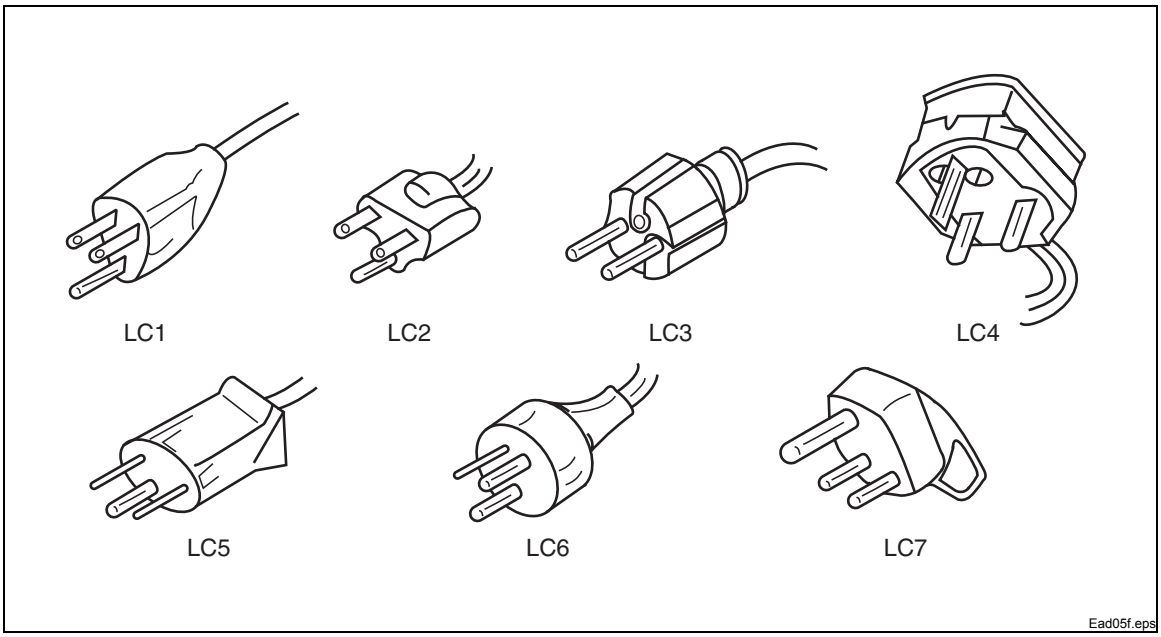
⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, connect an approved three-conductor mains power cord to a grounded power outlet.

The various power cords available for use with the Instrument are listed and shown in Table 2-3. Use the table to identify your general location and the recommended LC power cord. Match this LC number to one of the plugs in the drawing, and verify that the plug on your power cable mates correctly with the local power outlets. If the plug is incorrect, identify the correct LC number, and order the correct power cable from Fluke using the part number from Table 2-3.

Table 2-3. Power Cord for Various Regions

Description	Location	Voltage/Current	Part Number	
Power Cord	North America	120 V/15 A	LC1	284174
	North America	240 V/15 A	LC2	2198736
	Universal Euro	220 V/16 A	LC3	769422
	United Kingdom	240 V/13A	LC4	769445
	Switzerland	220 V/10 A	LC5	769448
	China/Australia/New Zealand	240 V/10 A	LC6	658641
	India/South Africa	240 V/5 A	LC7	782771



Replacing the Line-Power Fuses

⚠⚠ Warning

To prevent fire hazard or damage to the product, verify that the correct fuses are installed for the selected line-voltage setting. See Table 2-4 for the correct fuse ratings.

The line-power fuses are located on the power block on the rear panel. The selected line-voltage (115 or 230) shows through a small window toward the bottom of the block. See Figure 2-1. This instrument has dual fusing with fuses in both the line and neutral connections. When replacing a blown fuse, replace both fuses to avoid a stressed fuse and subsequent power interruption. Before trying to access and replace the fuses, verify that the replacement fuses are appropriate for the selected voltage.

To check or replace the fuses, refer to Figure 2-1, and proceed as follows:

1. Disconnect the Instrument from line power.
2. Remove the fuse compartment by inserting a screwdriver blade in the tab located at the left side of the fuse compartment. Gently pry until the compartment can be easily removed.
3. Pull the fuses from the compartment for replacement or inspection.
4. Install good fuses with the correct ratings. See Table 2-4.
5. Reinstall the fuse compartment by pushing it back into place until the tab locks.

Table 2-4. Line-Power Fuse

Line Power	Fuse Action	Fuse Rating IEC 127	Fluke Part No.	Manufacturer and Type No.
115 V AC	TH Time Delay HBC	10 A @ 250 V	2650727 (Quantity 2)	Littelfuse 215010
230 V AC	TH Time Delay HBC	5 A @ 250 V	2650730 (Quantity 2)	Littelfuse 215005

Selecting Line Voltage

The line-voltage selector is located on the power block on the rear panel. The selected line-voltage (115 or 230) shows through a small inspection window toward the bottom of the block. See Figure 2-1. Use Table 2-5 to verify the selection before trying to change it.

Use the following procedure to change the line voltage setting:

1. Disconnect the Instrument from line power.
2. Remove the fuse compartment as described earlier. (See *Replacing the Line-Power Fuse*.)
3. Remove the line-voltage selector by griping its indicator tab with a pair of long-nose pliers and pulling it straight out of its connector.
4. Rotate the line-voltage selector to show the desired voltage, and reinsert into the power block.
5. Before inserting the fuse compartment back into the power block, inspect and verify that both fuses are appropriate for the selected voltage.
6. Insert the fuse compartment into the power block, and press firmly to lock its tab.

Table 2-5. Voltage Limits for the 115 and 230 Voltage-Switch Settings

Switch Setting	Line Voltage Limits
115	90 V AC to 132 V AC
230	180 V AC to 264 V AC

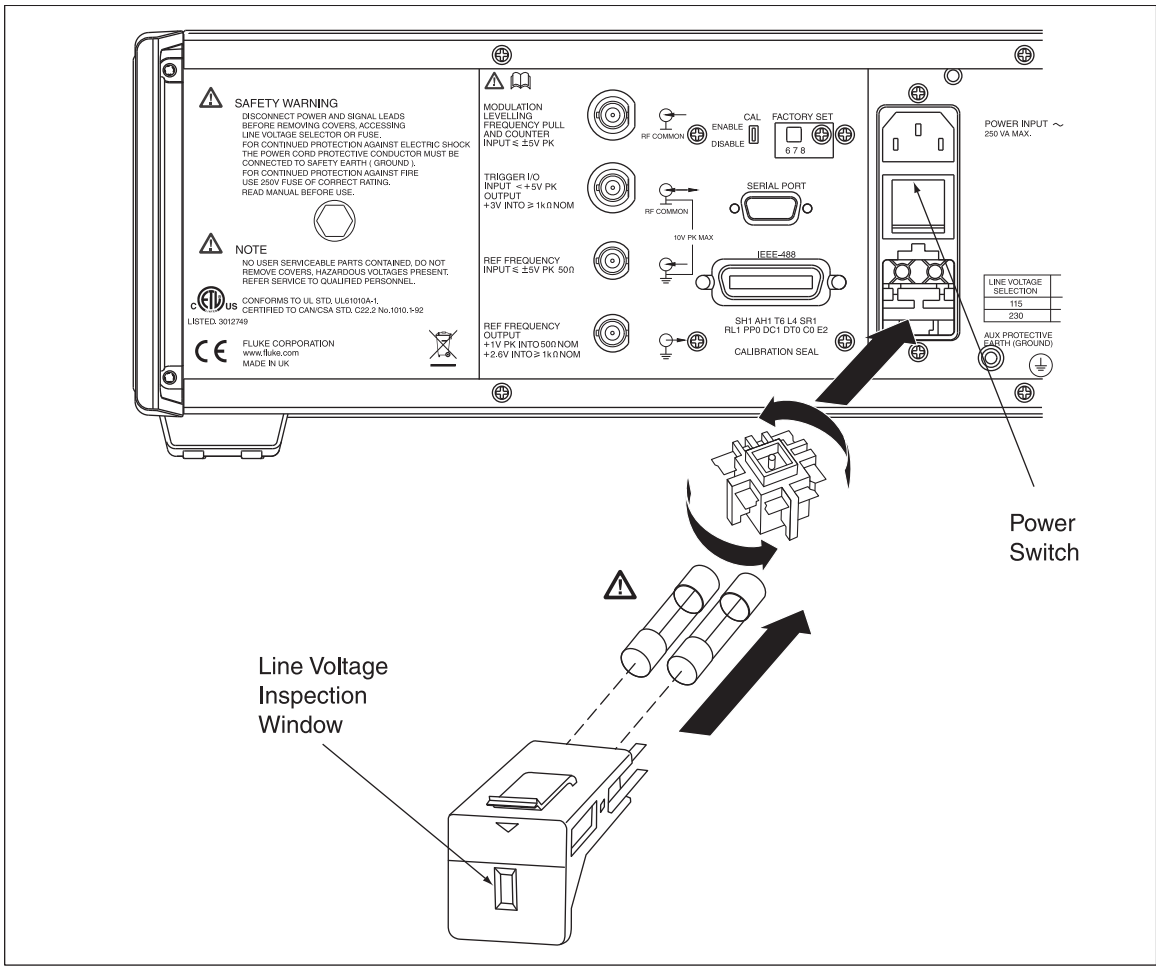


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Figure 2-1. Accessing the Fuses and Changing Line Voltage

Power-On Sequence

Note

The power-on sequence may be run with or without a Leveling Head connected to the Instrument.

After connecting the Instrument to line power, use the power switch on the rear panel to power-on the Instrument. See Figure 2-1.

The Instrument displays an initialization screen for about 4 seconds during the power-on sequence and then runs a power-on self test. If a Leveling Head is connected to the Instrument, the Leveling Head will also be tested.

ead07f.bmp

Initialization Screen

Power-On Self Test

The power-on self test performs a functional test of the source and, if attached, the Leveling Head. The self test is neither an acceptance test, performance test, nor verification test. Self test simply verifies the overall functional operation of the Instrument. The power-on sequence initiates the self test, and the test is run every time a power-on sequence occurs.

A progress bar at the bottom of the display indicates self test is running. Upon successful completion of the test, a Leveled Sine screen, similar to the First Power-On screen, replaces the initialization screen shown earlier. The appearance of the Leveled Sine screen indicates the Instrument is ready for use.

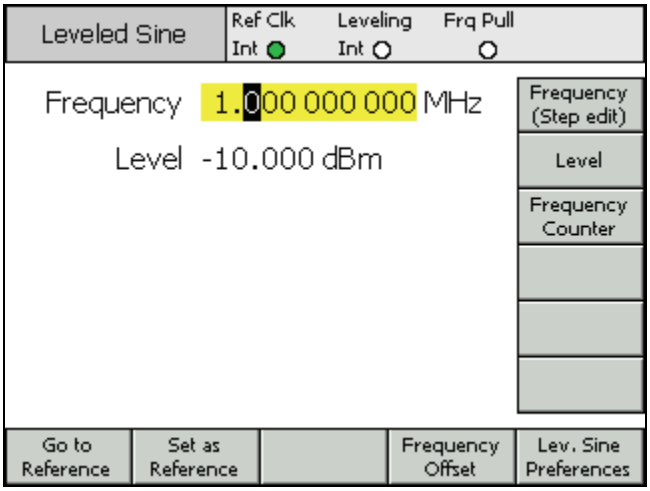
If any test in the self-test sequence fails, another screen will show the number of failures attributed to both the Leveling Head and the Instrument. The user can view any failures by pressing the View Fail softkey. For more information regarding self-test failures refer to Chapter 7, *Reviewing the Results* and *Interpreting the Results* in *9640A/9640A-LPNX Instruction Manual*.

Power-On State

After completing the power-on self test, the Instrument enters the Standby state (output off) as indicated by the illuminated STBY key on the far-right of the front panel.

At first power-on, the Instrument displays the following screen. Press OPER to obtain an RF output. If no Leveling Head is connected, the Instrument remains in the standby state (output off) and displays an error message.

Note that some Instrument settings are stored for recall at power down. If this is not the first power-on sequence for the Instrument, the power-on screen may not match the one shown here.



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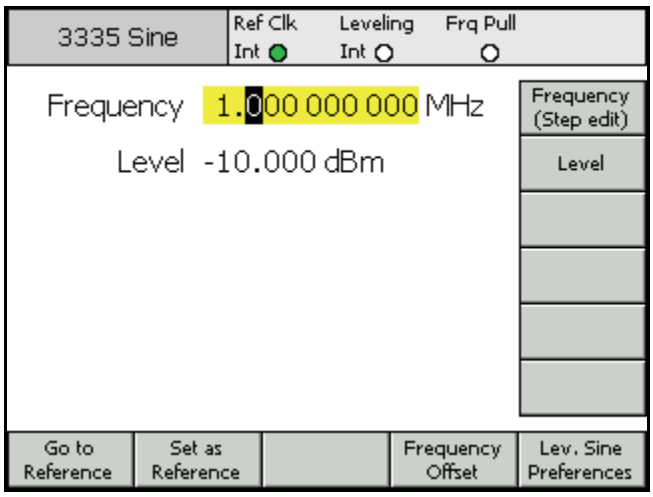
First Power-On Screen

In particular, the Instrument may be found in a special GPIB command emulation mode of operation. This mode, identifiable at the top left corner of the display, would prevent normal GPIB operation. Instructions for selecting or deselecting the emulation mode are given in Chapter 3, see *GPIB Command Emulation*. Instructions for the trial and purchase of these options and entering of license keys are also given.



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First Power-On Screen (GPIB emulation mode)

Leveling Head Connections

⚠ Warning

To prevent hazardous RF transmissions and equipment damage, read and follow the instructions in Chapter 3 before connecting a Leveling Head to the Product or to a UUT.

Instructions for connecting a Leveling Head to the Instrument and to a unit under test (UUT) are given in Chapter 3, *Local Operation*. Do not attempt to connect a Leveling Head before reading all of the Cautions and Warnings, contained in these instructions.

Installing the Instrument in an Equipment Rack

The Instrument is suitable for both bench-top and rack-mounted operation. A Rack Mount Slide Kit is available as an accessory. Instructions for installing the kit are supplied with the kit.

Cooling Considerations

Two internal fans maintain the operating temperature of the Instrument at a safe level. For bench-top operation, these fans maintain temperature control without any attention other than routine cleaning of the filter as described in Chapter 7, *Maintenance* in the *9640A/9640A-LPNX Instruction Manual.*

However, when mounting and using the Instrument in other situations (for example, in an equipment rack) additional attention may be required to ensure that the instrument is able to maintain a normal operating temperature and does not overheat.

⚠ Warning

To avoid fire hazard and to ensure that the product does not exceed its normal operating temperature observe the following warnings:

- **During normal operation, keep the Product covers securely in place. Excessive air leaks can interrupt and redirect the flow of cooling air from internal components.**
- **When mounting the Product in an enclosed equipment rack, provide adequate ventilation and airflow within the rack. Pay particular attention to ensure adequate and proper use of exhaust fans, louvers, equipment spacing, free-flowing and isolated intake and exhaust ports.**

  Use baffles, if necessary, to isolate intake air from exhaust air. Baffles can help draw and direct cooling air through the equipment rack. The best placement of the baffles depends on the airflow patterns within the rack. If baffles are necessary, experiment with different arrangements.

Cleaning the Instrument

For general cleaning, wipe the Instrument with a soft cloth dampened with water or a non-abrasive mild cleaning solution that does not harm plastics.

⚠ Caution

To prevent damage to the Product, do not use aromatic hydrocarbons or chlorinated solvents for cleaning. They can damage the materials used in the Product.

Chapter 3
Local Operation

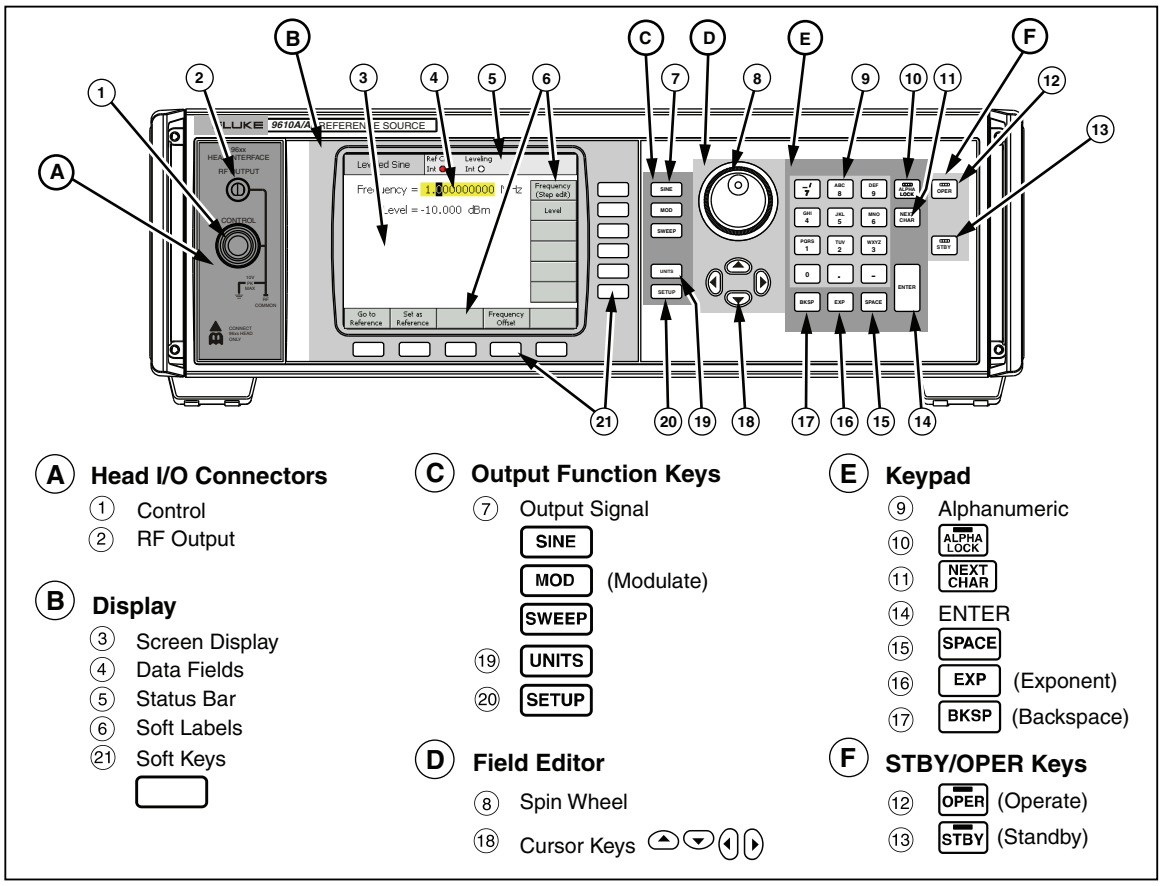
Introduction

This chapter provides a comprehensive introduction of all of the external features and functions on the Instrument, followed by instructions for operating the Instrument. The introduction identifies each of the front- and rear-panel controls, connectors, and indicators (including screens), and describes the intended use for each. Each feature description is complete enough to allow the user to begin interacting with the controls and to perform basic but practical operations on the Leveled Sine screen.

Refer to Chapter 3 of the *9640A/9640A-LPNX Instruction Manual* for additional procedures for creating sine, modulated, and swept output signals. Procedures for expanded features, such as offset, are also provided in the *9640A/9640A-LPNX Instruction Manual*.

Controls, Indicators, and Connectors

The front panel of the Instrument is shown in Figure 3-1. Each feature is identified with a name and graphical grouping. The same name and graphic introduce the section and paragraph(s) containing the description of the feature.



ead10f.eps

Figure 3-1. Front Panel Controls, Indicators, and Connectors

Head I/O Connectors

The output of the Instrument is a proprietary interface to a 9640A-50, 9640A-75 Leveling Head, or either Head via a 9600FLT Phase Noise Filter (optional). The interface consists of two connectors: an SMA RF signal output connector, and beneath, a multi-way locking connector for sensing and control of the Leveling Head.

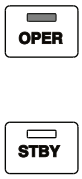
⚠ Caution

The 9640A front-panel connector interface is suited only for use with Fluke 9640A-xx Leveling Heads or the 9600FLT Phase Noise Filter. To avoid damage to the Product no other connection is permitted.

The function of a Leveling Head is to deliver the Instrument output to the input of another instrument (UUT) while maintaining the integrity of the signal. Using a Leveling Head with the Instrument is the equivalent of connecting the UUT directly to the Instrument output without using cables. The Leveling Head not only maintains the overall quality of the signal, it also maintains an accurate level for the signal over the frequency and amplitude range of the Instrument.

STBY/OPER (Standby/Operate) Keys

The STBY and OPER keys control signal availability at the Leveling Head Output connector. Pressing OPER turns the green indicator on and places the Instrument in the Operate mode (enables the signal at the RF Output connector). Pressing STBY turns the yellow indicator on and places the Instrument in the Standby mode (removes the output signal at the RF Output connector).



ead11f.eps

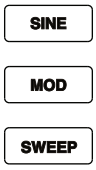
Standby/Operate Keys

Output Function Keys

There are five output function keys: three for selecting the output signal, one for defining the preferences, and one for displaying units associated with each signal.

Output Signal Keys

Three hard keys define the main characteristics of the output signal. They are SINE, MOD (modulation), and SWEEP. Pressing any one of these keys brings up the initial screen for that function and displays the current value for each of the previously defined parameters. If, when any of these keys are pressed, the Instrument is in the operate mode (Green light on the OPER key is lit), the RF Output is switched to standby.



ead12f.eps

Output Signal Keys

UNITS Key

Use the UNITS key to display a list of the measurement units available for use with the selected data field. The list is context sensitive and appears on the vertical soft labels. Pressing a blue softkey adjacent to one of the displayed measurement units selects and applies that unit to the value in the selected field. The value in the field is recalculated to match the selected measurement unit, and the text is removed from the soft labels.

ead13f.eps

Measurement Units Key

SETUP Key

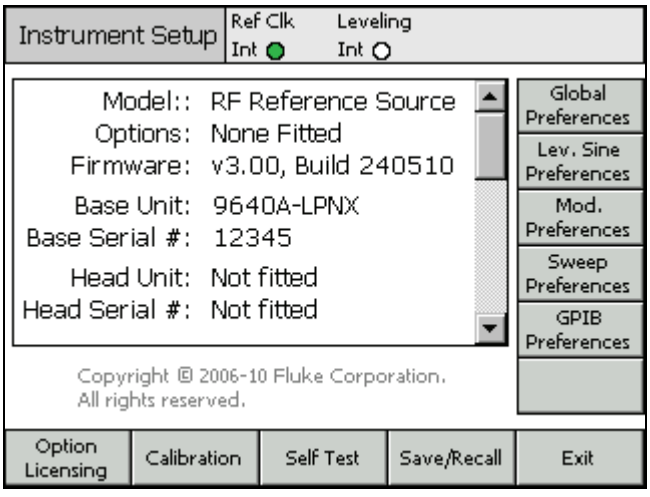
The SETUP key provides access to a Setup screen.

ead14f.eps

Setup Key

The Setup screen provides instrument configuration information, including the following:

- Options Fitted (installed)
- Firmware Version
- Base (mainframe) model number and serial number
- Model number and serial number of the connected Leveling Head at the time the SETUP is pressed



ead05f.bmp

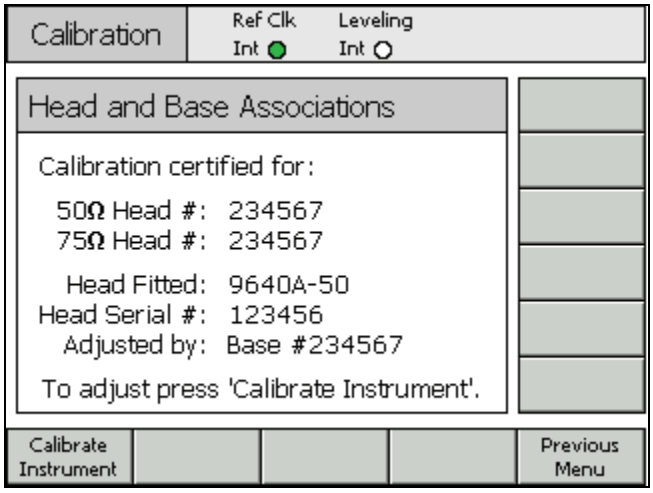
Setup Screen

The vertical softkeys on this screen allow the user to enter personal preferential settings for Global Preferences and each of the major configuration screens. These settings take effect immediately upon editing. They include the following:

- Global Preferences
- Sine Preferences
- Mod Preferences

- Sweep Preferences
- GPIB Preferences (IEEE 488)

Pressing the License softkey accesses the entry of License Keys provided when certain options are purchased; for example, the 8662/8663 GPIB personality or the 9600FC Frequency Counter. The Calibration softkey accesses a Calibration screen which lets you correctly associate the Base Unit and Leveling Heads that have been calibrated together. The Calibration screen shows the serial numbers of the 50 Ω and 75 Ω Leveling Heads with which the Base Unit is calibrated. For the Leveling Head connected at the time the softkey is pressed, the calibration screen also shows the serial number of the Base Unit with which that head is calibrated.



ead06f.bmp

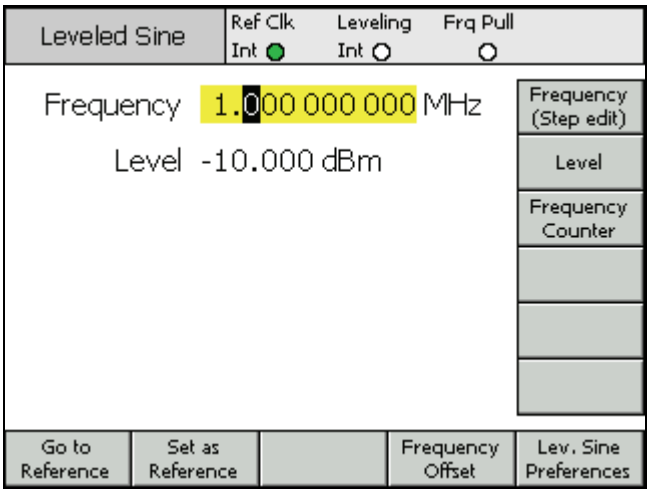
Calibration Screen

Display

The display is a visual line-editor/menu for configuring the output of the Instrument, and a monitor for verifying the configuration and output settings for the Instrument. The screen portion of the display consists of the following three major sections:

- Data fields
- Soft labels
- Status bar

Pressing any one of the main function keys on the front panel, SINE , MOD , SWEEP , brings up the appropriate main screen on the display (see the following Leveled Sine screen). Editable data fields occupy the central portion of the screen; the status bar is at the top of the screen. The soft labels run down the right side and across the bottom of the screen.



ead15f.bmp

Leveled Sine Screen

Data Fields

Data fields contain numeric values that effectively describe the present output parameters of the Instrument. Following power-on, these fields all contain default values. To change or edit these values the user must do the following:

1. Bring up an appropriate screen, for example, the previous Leveled Sine screen.
2. Select the field that requires editing (use a softkey).
3. Select an edit mode, Cursor or Step (press the softkey again).
4. Edit the data in the field using the appropriate controls.

When selected, field *focus* is easily identified by the shading of its data. In the Leveled Sine screen, for example, the Frequency field has the *focus,* and the edit mode is Cursor, as identified by the black cursor (marker) that can move from digit to digit (left-right, ◀▶). In this case, the user can easily make minor edits to the selected digit using the spin wheel or the up-down (▲▼) keys. If several characters in the field need to change, using the alphanumeric keypad to edit the field (Keypad edit) is a better choice.

A data field that has all of the characters in the field selected (highlighted black) is in the Step edit mode. When this mode is available to a field, an indicator shows in the soft labels to the right of each field, (Step edit) or (Cursor edit). A toggle effect performed by the softkey next to the *focus* field allows the user to switch between edit modes.

A more detailed description of the *Editing Settings* is available later in this chapter under *Screen Controls and Indicators*.

Soft Labels

Six soft labels run vertically along the right side of the screen and five run horizontally along the bottom of the screen. Each of the labels corresponds to an adjacent softkey. When a soft label contains text, pressing its adjacent softkey directs the display to respond accordingly.

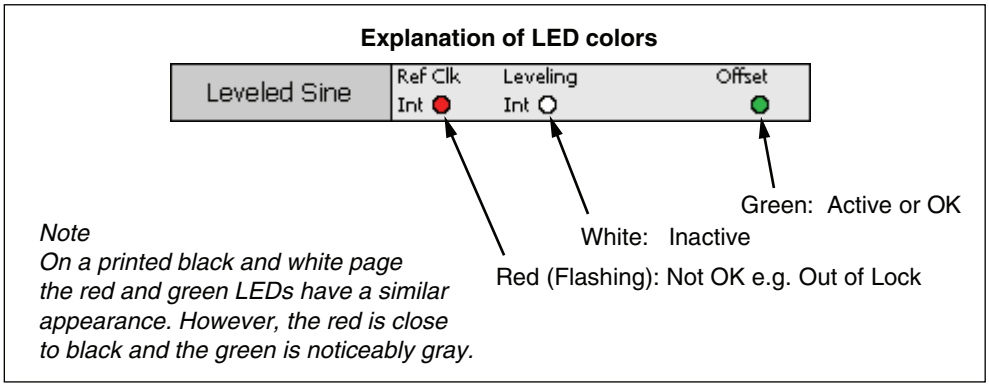
The horizontal soft labels across the bottom of the screen provide prompts to expand the current definition, add/remove fields, or call another screen (menu selection).

Pressing [UNITS] while in either of two field edit modes (cursor or step edit) causes the soft labels to present a selection of measurement units for use with the selected field. During alphanumeric (keypad) edit, the soft labels present a selection of scientific multipliers for use with the selected field. These multipliers are shown in terms of the previously selected units (watts, dB, volts).

If a soft label contains no text, pressing its adjacent softkey has no effect. However, when a labeled softkey is pressed the effect is immediate and obvious on the display.

Status Bar

The status bar consists of two regions across the top of the display (see Figure 3-2). There are no keys associated with the status bar as its only function is to provide information. Typically, the left-most label defines the RF Output signal: sine, modulated, or swept. It also indicates a GPIB command emulation mode. The right-most region contains status indications (virtual LEDs) pertinent to the current output signal. Operator error messages, such as *value too low*, are also displayed in this region.



ead23f.eps

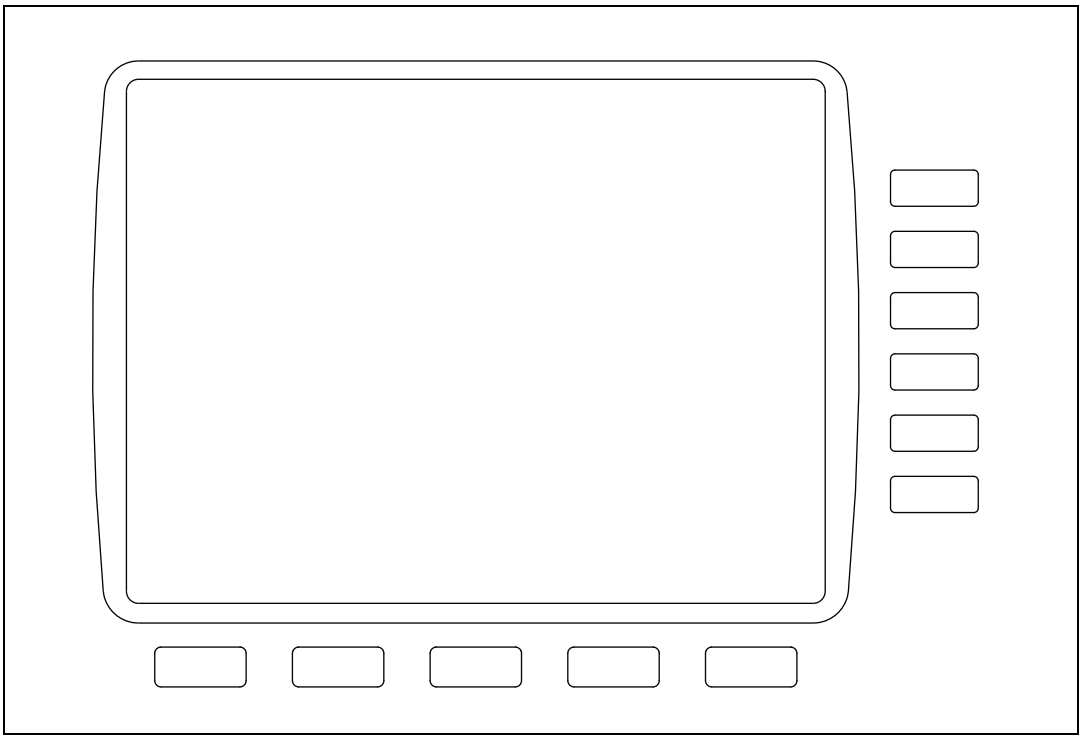
Figure 3-2. Status Bar

Softkeys

The Instrument has two sets of softkeys. One vertical set running down the right side of the display and one horizontal set running across the bottom of the display. Each of these softkeys has an adjacent soft label on the screen.

The primary function of the vertical softkeys is for selection of the *focus* field, and in some cases the edit mode (Cursor edit or Step edit) for the *focus* field. These keys are also used to temporarily present scientific multipliers during alphanumeric entry using the keypad and unit selections, if [UNITS] is pressed.

The horizontal softkeys are associated with the soft labels across the bottom of the display. These labels provide prompts to expand the current definition, add/remove fields, or call another screen (menu selection).



ead16f.eps

Softkeys

Field Editor

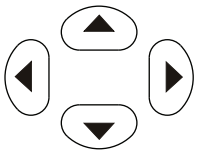
There are two control sets for incrementally editing field data. They are the cursor keys and the spin wheel.

Cursor Keys

The cursor keys are a group of four keys marked with right, left, up and down arrows: (◀, ▶, ▲, ▼). These are the main editing keys for making minor changes in a field's numeric data. Each press of ◀ or ▶ moves the cursor one decade to the left or right. Each press of ▲ or ▼ increments or decrements the digit under the cursor by one. Using these cursor keys in combination allows the user to edit/select any data in a *focus* field.

The data in the *focus* field reacts to the ▲ and ▼ keys like a counter. That is, as the value under the cursor increases past nine (9), the number in the next higher decade increases by one (1). Similarly, as the value under the cursor decreases past zero (0), the number in the next higher decade decreases by one (1).

When the Instrument is in the operate mode (OPER light on), the RF Output responds immediately to changes to its field values.

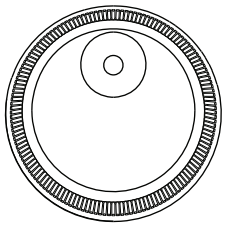


ead25f.eps

Cursor Keys

Spin Wheel

The Spin Wheel performs the same editing function as the ⏶ and ⏷ keys described in the previous paragraph. However, as the wheel is spun, it continues to decrement (ccw) or increment (cw) the digit under the cursor. This continuous spin-action is useful for making larger changes to field values and for making real-time changes to the RF Output.

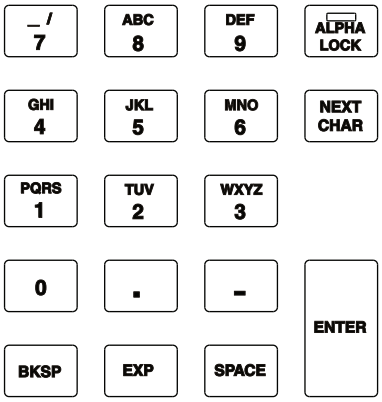


ead26f.eps

Spin Wheel

Keypad

The alphanumeric keypad supports direct keypad edit of a numeric field. Alpha entry is also supported, but only to allow the naming of user Saved Set-ups.

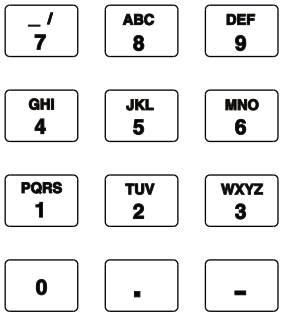


ead27f.eps

Keypad

Alphanumeric Keys

The alphanumeric keys are similar to those found on a calculator. They include two levels of characters. The default level includes the digits 0 through 9. The shifted or second level includes the alpha characters A through Z, _ and /. The decimal point (.) and minus (–) characters work with both levels. Notice that the alpha characters are grouped so that three or four characters appear on a single key, much like the telephone keypad. When entering an alpha character, press the key containing the desired character. The first character in the alpha grouping appears in the field. Press [NEXT CHAR] one or more times to advance to the desired character in the group. When the character is correct, press key containing the next alphanumeric character.



ead28f.eps

Alphanumeric Keys

ALPHA Key

The [ALPHA LOCK] key controls access to the numeric (default level 1) and alpha (level 2) characters. The key operates in a toggle mode. When the light is off, the numeric characters are accessible. Pressing [ALPHA LOCK] to light the key enables access to the alpha characters.

ead29f.eps

Alpha Key

NEXT CHAR Key

The [NEXT CHAR] key is functional when the light on the [ALPHA LOCK] key is lit. After pressing an alpha character key, use [NEXT CHAR] to select the desired letter from the alpha grouping shown on that key. When the desired character appears in the selected field, stop pressing [NEXT CHAR]. Instead, press the alpha key containing the next character to be added to the field, or, if the field data is complete, press the ENTER key.

ead30f.eps

Next Character Key

BKSP Key (Backspace)

The [BKSP] key permits editing of characters during a keypad data-entry session. After

entering the first character in a field, pressing BKSP deletes the last available character and allows another character to be entered in its place. This backspace action is available as long as characters are present in the field.

ead35f.eps

Backspace Key

SPACE Key

The SPACE key functions exactly like the space key on a PC keyboard. Pressing SPACE inserts a space character to separate any combination of alphanumeric characters.

ead36f.eps

Space Key

EXP Key (Exponent)

The EXP key allows the user to enter numeric data using an exponent. While entering a number, pressing EXP ends the numeric sequence by inserting a capital letter E to indicate that the following number is an exponent.

ead37f.eps

Exponent Key

ENTER Key

The ENTER key ends the keypad data-entry process and allows the user to move to another task. Pressing the ENTER key causes the Instrument to inspect the data just keyed into the field, and, if it is valid, to accept and retain the data. The Instrument rejects invalid data and displays the reason for rejection on the Status Bar.

ead38f.eps

Enter Key

Screen Controls and Indicators

Many of the front panel controls and indicators discussed earlier in this chapter are used exclusively for editing screen fields that appear on the Display. That is, they enable the data entry/editing process regardless of the selected screen. The following examples concentrate on the controls and indicators associated with the Leveled-Sine screen. They offer an excellent opportunity for applying information learned about the editing process.

Main RF Output Screens

The Instrument provides three kinds of output signals: sine, modulated, and swept. User selectable screens, as shown in Figure 3-3, provide the controls for each of these outputs.

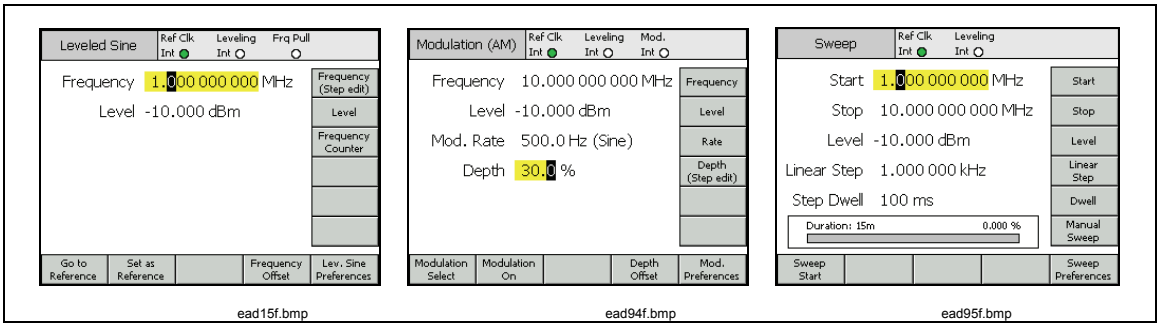


Figure 3-3. Control Screens for the RF Output Signal

Pressing [SINE] sets the Instrument to standby and brings up the Leveled-Sine screen, establishing the sine wave as the selected RF output signal. The same is true of the [MOD] and [SWEEP] keys. As each key is pressed, the instrument enters standby and brings up the corresponding modulation or sweep screens. Pressing [OPER] sets the Instrument to operate and adjusts the RF output signal to match the screen.

Data fields within each screen contain values, typically numeric data, which define the parameters of the RF Output signal. By editing these values, the user can precisely control the RF output signal.

Editing Settings – The Vertical Softkeys

Each numeric data field supports up to three edit modes:

- Cursor edit
- Step edit
- Keypad edit

Any time a field has the *focus* it is in one of the three edit modes. A unique look (or pattern) identifies each of the modes. The Cursor edit mode displays a shaded field with a black cursor placed over a single digit in the field. The Step edit mode displays the entire field shaded black with white characters. The Keypad edit mode displays a shaded box for entering characters. The user may choose any one of these edit modes when entering numeric field data.

The following paragraphs use the Leveled-Sine screen to discuss the edit modes. The edit modes and the techniques discussed here also apply to the Modulation and Sweep screens. The Modulation and Sweep screens are not, therefore, discussed separately.

Note

Step edit *does not apply to the sweep screen. Only* Cursor edit *and* Keypad edit *are available in the sweep function.*

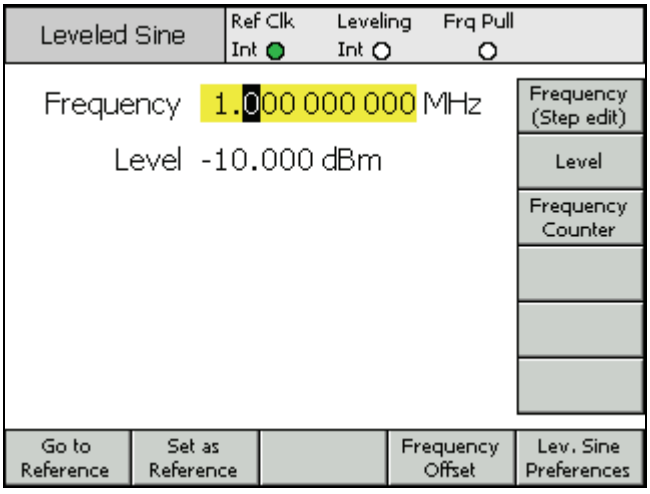
Before proceeding, refer to the *Data Fields* descriptions earlier in this section under *Controls, Indicators, and Connectors (Display)* as a refresher on how to select data fields.

To follow the discussion on the Instrument, switch on power to the Instrument and then press [SINE] to bring up the Leveled-Sine screen. Press STBY to set the source to standby. Also, remove any connections from the front panel Leveling Head I/O Connectors. The screen on the I/O Display will closely resemble the following Leveled-Sine screen.

Cursor Edit

When in the Step edit mode, if the soft label for the focus field includes a (Cursor edit) marking, press the Frequency (Cursor edit) softkey; the focus field changes the edit mode to Cursor edit.

In Cursor edit mode, the *focus* field pattern is shaded with a black cursor placed over a single digit. In addition, the soft label for the field includes a (Step edit) marking, when appropriate, as shown in the following Leveled-Sine screen. The cursor keys provide for right and left cursor movement within the field. To adjust the value of the selected digit, the user may choose between the ⏶ ⏷ keys or the spin wheel. To ensure access to the full dynamic range and resolution of the instrument, notice that the cursor will move beyond the left- and right-most digits in the field.



ead15f.bmp

Leveled Sine

Step Edit

If, when in the Cursor edit mode, the soft label includes a (Step edit) marking, pressing the softkey for the *focus* field changes the edit mode to Step edit. Notice that Step edit is not available for inappropriate fields.

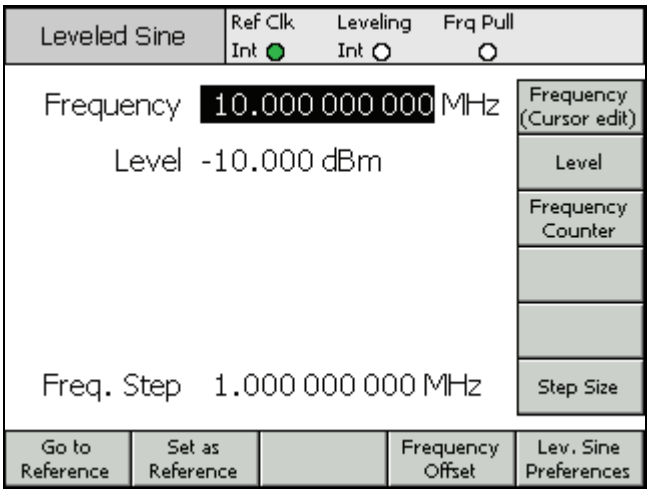
In Step edit mode, the *focus* field pattern is fully highlighted (all black) with white characters. In addition, the soft label for the field includes a (Cursor edit) marking. See the following Step Edit screen. Effectively, the whole field is selected for edit, making cursor movement within the field unnecessary. Instead of allowing the edit of a single character, Step edit allows for updating of the focus field in increments of a preset step size. The step size is defined (preset) in a Step Size field at the bottom of the display. With the step size set to a value other than zero, both the up-down cursor keys (⏶ ⏷) and the spin wheel allow for increasing or decreasing the *focus* field value in steps.

Note that the soft label for the *focus* field now indicates Cursor edit, allowing the operator to return to this edit mode. This softkey, therefore, has the following three-step operation:

Select New *Focus* Field Select Step edit Select Cursor edit

The operator can rapidly access Step edit in a new *focus* field by pressing the appropriate softkey twice.

Pressing the Step Size softkey, moves the *focus* field to allow step size to be adjusted using the Cursor edit or Keypad edit modes. Unit selections are available for Step Size, these can be ratios %, ppm, dB or the same unit as the parent field.



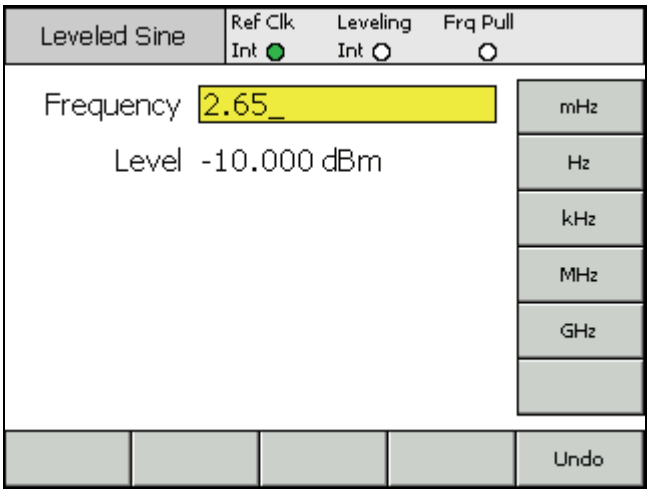
ead17f.bmp

Step Edit

Keypad Edit

At any time, a new value may be entered directly in a numeric *focus* field via the Keypad. The first press of a numeric key will open an edit box in place of the current field and present scientific multiplier options on the vertical softkeys. See the following Keypad edit screen. Pressing the ENTER key or a multiplier softkey will transfer the new value into the *focus* field. Note also the presence of an Undo softkey and that an invalid entry will cause an error message and return the *focus* field to its previous value.

The backspace (BKSP) and exponent (EXP) keys are also active in the Keypad edit mode.

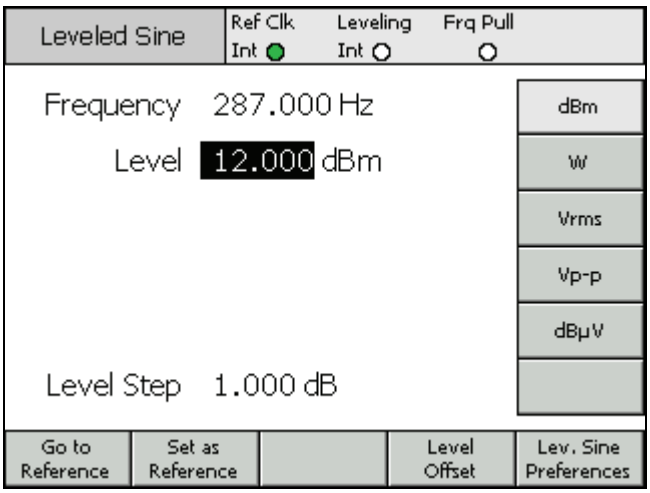


ead18f.bmp

Keypad Edit

Changing Displayed Units

Measurement Units are usually associated with digital values. In the case of the Instrument, the units are typically associated with frequency and level. Pressing UNITS while a field is selected provides a list of measurements units that apply to the value. See the following measurement units screen. Selecting one of these units causes the Instrument to recalculate and display the value in the specified unit. Typical measurement unit selections for Level include the following: dBm, W, Vrms, Vp-p and dBµV.



ead19f.bmp

Measurement Units

Note

The Instrument supports multiple unit scales for display and editing. Each scale has finite resolution, and the finite steps of each scale will not necessarily align. It is therefore possible that conversion of a setting to a different unit followed by conversion back to the original unit could cause a one-step shift in the setting.

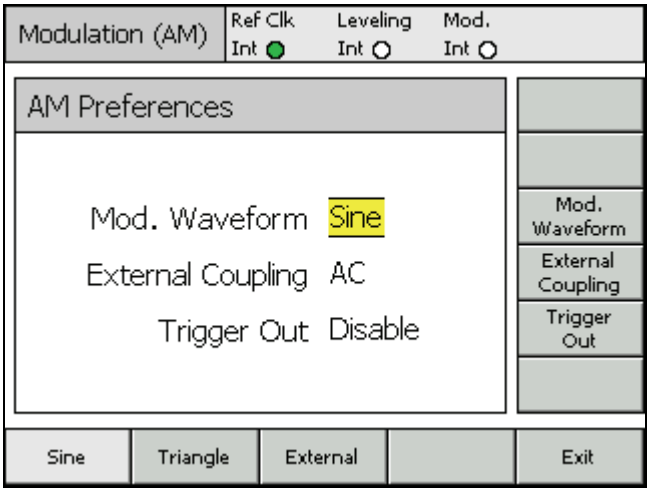
The Instrument User Interface specifically avoids this potential problem. That is, it allows the user to view a setting in an alternative unit and then return without disturbance.

Expanded Settings – The Horizontal Softkeys

The horizontal soft labels across the bottom of the screen provide prompts to expand the current definition, add/remove fields, or call another screen (menu selection).

Preferences Softkey

All of the screens for settings preferences are listed on and accessible from the Instrument Setup screen which can be called by pressing SETUP . However, settings preferences relevant to the current mode of operation are more readily accessible via the bottom-right softkey on the Leveled Sine, Modulation and Sweep screens. AM Modulation Preferences are shown in the following screen



ead10f.bmp

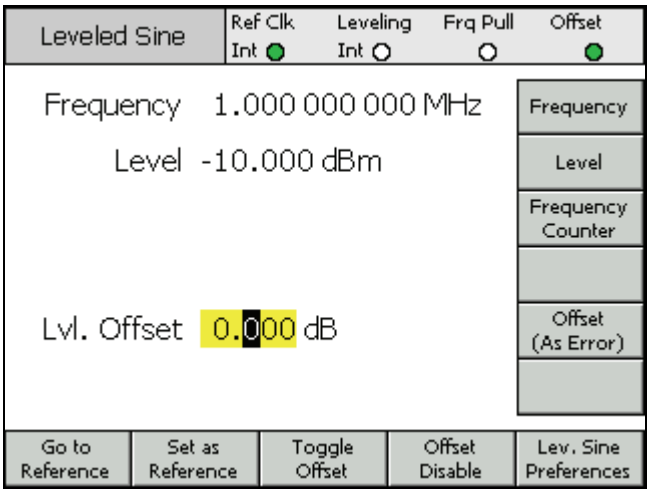
Modulation Preferences

The principle of the *focus* field and its selection by way of the vertical softkeys also apply to preferences screens. The cursor, indicated by two parallel bars highlights a scrolling list of possible entries. The spin wheel or all four cursor keys can be used to scroll the list, and the Exit softkey completes the update, returning the display to the previous screen. Where the scroll list is short (as in the preferences screens), the horizontal softkeys give more convenient direct access to the preferences.

Offset Softkey

The Offset key allows the operator to adjust the Instrument output via an offset from the main setting. The soft label tracks the *focus* field, allowing control of either Frequency Offset or Level Offset.

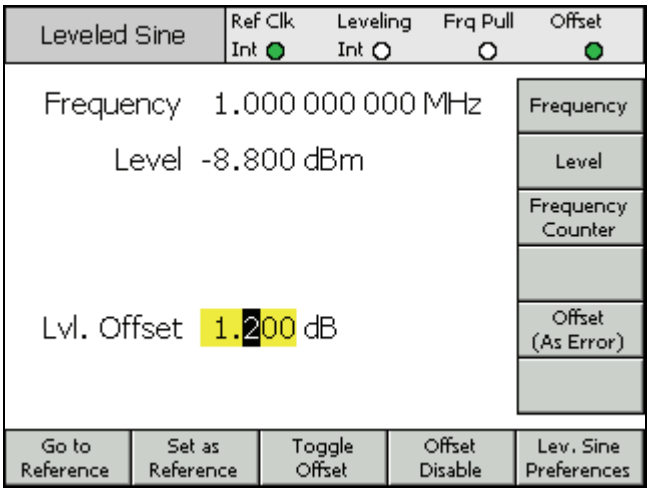
For example, assuming Level to be the current *focus* field, pressing the Offset softkey will add and select the Level Offset field as the new *focus* field. In the following Leveled Sine screen, a new indicator appears on the Status Bar indicating that Offset is on.



ead02f.bmp

Leveled Sine – No Offset

This new Offset field supports Cursor or Numeric edit and its value will be added to the current output to give a new output level. See the following Leveled Sine – Offset Applied screen. The display indicates the current output level and the offset value that achieves it.



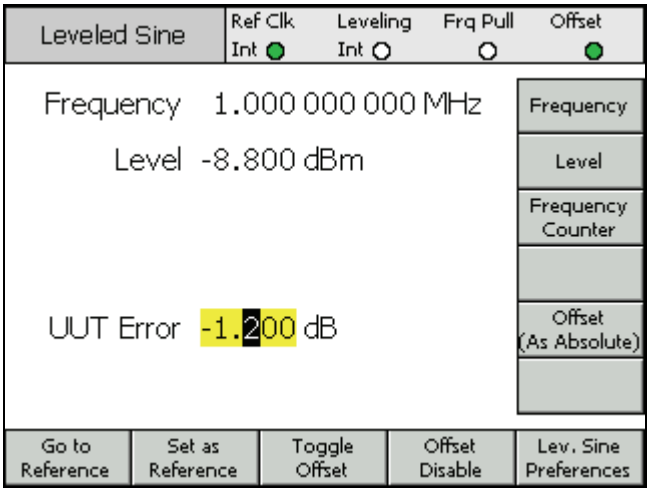
ead03f.bmp

Leveled Sine – Offset Applied

Note that editing the main Level field with Level Offset enabled causes the current Offset value to reset to zero. In addition, pressing the Offset Disable softkey clears the Level Offset field and its related status bar indicator and soft labels.

Toggle Offset Softkey

Note that while the Offset field is present, a Toggle Offset softkey is also present. In the following Leveled-Sine – Toggle Offset screen, the Toggle Offset softkey may be pressed at any time to remove the offset from the output. The initial (Offset = 0) value is restored and the Offset indicator on the Status Bar turns off.



ead04f.bmp

Leveled Sine - Toggle Offset

An additional press of the Toggle Offset softkey reapplies the offset, allowing convenient toggling of the output between its initial and its offset values.

Offset (As Error) Softkey

In a typical calibration application in which the Instrument has been set to a target Level (or Frequency), an offset may be applied until the UUT reads exactly the target value. The offset setting is now related to the UUT error.

When the Offset field is the *focus* field, both its display and edit format may be switched from an expression of offset of Instrument output to an expression of Error in the UUT. This results in a convenient and accurate readout of UUT error for which display units may be selected independently.

Note

If a UUT reads high (and has an Error of +Err,) it is clear that the Instrument will have to be adjusted down by an Offset –Off to achieve the target reading.

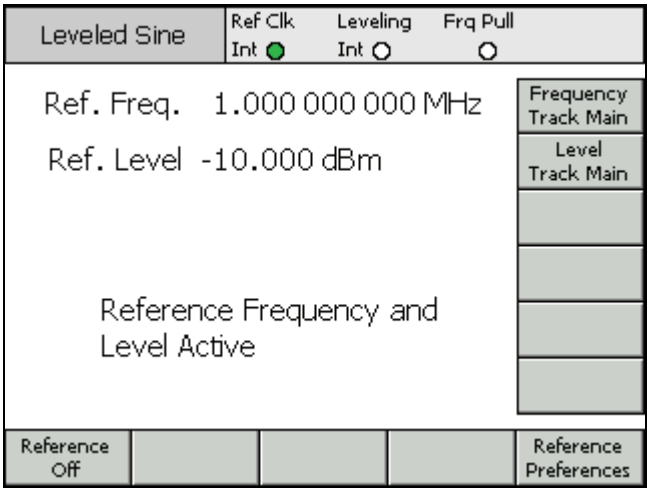
It is often thought that Offset and Error will merely be of opposing signs, i.e. +Err = -Off. This is only true if Offset and Error are both expressed in ratio units of dB. To express Error and Offset in % (or ppm), however, while the same is approximately true for small errors, a more substantial error of, say, +10 % will require a Instrument Offset of only -9.091 % to achieve the target reading. The two are non-linearly related. This calculation and display feature is frequently of great benefit.

Reference Softkeys

For the Leveled Sine function, the Instrument user interface also supports a Reference Frequency, a Reference Level or a Reference Point (Frequency and Level).

References may be an output setting that the user might need to return to frequently during a calibration application, perhaps to check or adjust for stability.

Two softkeys, Go to Reference and Set as Reference, give immediate access to the reference and can be pressed at any time. The Go to Reference softkey sets the output of the Instrument to the existing reference settings. The Set as Reference softkey transfers the current settings to establish a new reference setting. Both softkeys result in the display of Reference Settings and their application to the output, unchanged or updated dependent upon which key was pressed (see the following Monitoring the References screen).



ead21f.bmp

Monitoring the References

Note that the message Reference Frequency and Level Active appear when the Go to Reference softkey is pressed.

⚠ Caution

The reference settings could be a substantially different than the previous Level and/or Frequency output settings, and, if inadvertently applied, the resulting change in output signal may damage the load. To protect against this, the user may elect to switch to Standby as a Reference Preference prior to confirming the switch to the reference settings. Setting Reference Switching Preferences is described later in this chapter.

Switching of the Output signal to match the reference settings is otherwise immediate, and a Reference Active message is displayed.

Reference settings are not editable on this screen, no adjustment of output level or frequency can be made. New reference settings are established via the Set as Reference softkey only.

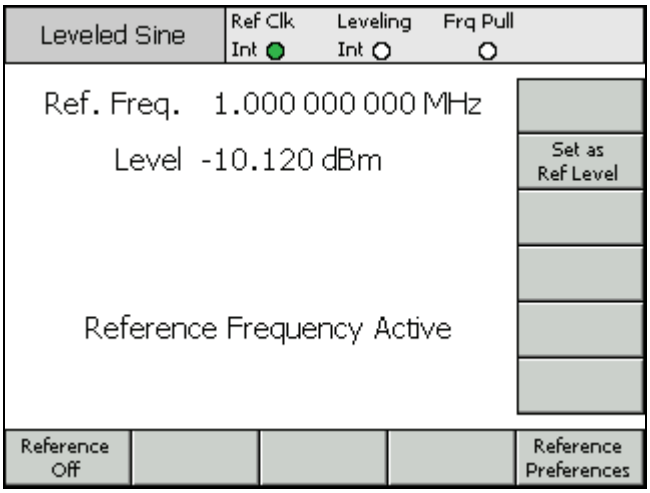
Reference Off Softkey

The Reference Off softkey returns the Instrument to the Leveled-Sine screen and its output settings. The message Switch from Reference – Confirm with Operate may appear if switching confirmation has been selected as a Reference Preference.

Frequency and Level Track Main Softkeys

The Set as Reference softkey always transfers the current Level and Frequency settings into the reference settings. If only a Ref Freq is required, the Level Track Main softkey should be pressed. This releases the Ref Level field to track the main Level setting. See the following Frequency and Level Tracking screen. Only the Ref Freq remains fixed.

The softkey beside the Level field can be used at any time to re-establish the current Level as a Ref level.

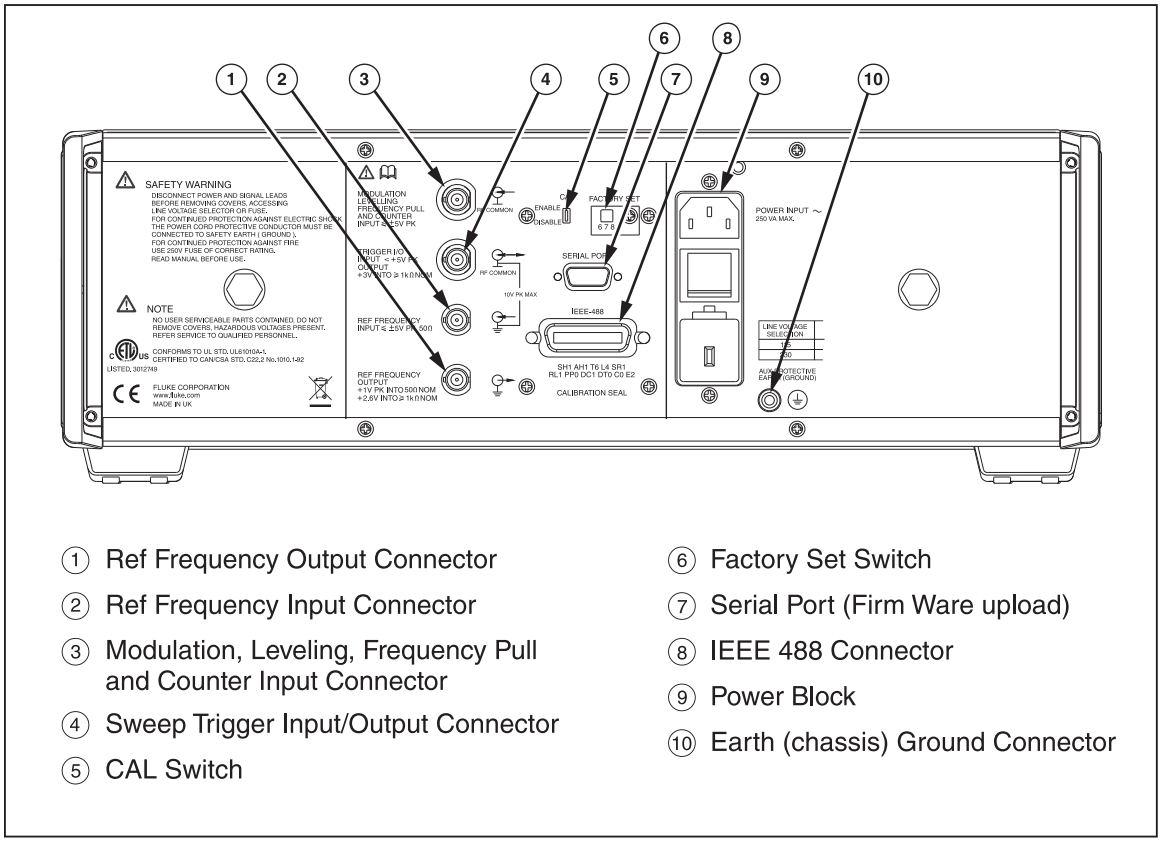


ead22f.bmp

Frequency and Level Tracking

Rear-Panel Controls and Connectors

Figure 3-4 shows the rear panel of the Instrument and identifies each of its controls and connectors. Functional and operational descriptions for each of the controls and connectors are given in the following paragraphs.



1. Ref Frequency Output Connector
2. Ref Frequency Input Connector
3. Modulation, Leveling, Frequency Pull and Counter Input Connector
4. Sweep Trigger Input/Output Connector
5. CAL Switch
6. Factory Set Switch
7. Serial Port (Firm Ware upload)
8. IEEE 488 Connector
9. Power Block
10. Earth (chassis) Ground Connector

ead44f.eps

Figure 3-4. Rear Panel Controls and Connectors

Power Block and Switch

The Power Block includes the power switch and a dual fused line-power input connector for the Instrument. Its universal design accommodates a variety of regional power cords, line-power (90 V to 132 V and 180 V to 264 V ac), and power fuses. These various line-power configurations and the procedures to establish them are described earlier in Chapter 2.

IEEE 488 Connector

The Instrument includes an IEEE 488.2, SCPI (1999) Remote Interface for connecting and controlling the Instrument remotely in a system environment. The IEEE 488 Connector provides the means for connecting a controlling system to the Instrument. The controlling system may be as simple as a PC or as complex as an automated calibration system.

Reference Frequency Output Connector

The Reference Frequency Output Connector is a rear-panel BNC connection that provides access to an internally generated reference frequency. See Table 3-1 for the output specifications.

Table 3-1. Reference Frequency Output Specifications

Parameter	Specification	Comments
Connector Type	BNC	Output referenced to Ground
Frequency	1 MHz or 10 MHz	User selectable
Amplitude into 50 Ω	1.5 V pk-pk nom	-0.4 V to 1.1 V nominal
Amplitude into 1 kΩ	3.0 V pk-pk nom	-0.4 V to 2.6 V TTL or 3 V compatible

Reference Frequency Input Connector

The Reference Frequency Input Connector is a BNC input connection for applying an external reference frequency. See Table 3-2 for the input specifications.

Table 3-2. Reference Frequency Input Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to Ground
Nominal Frequency	1 to 20 MHz	In user selectable 1 MHz steps. Phase Noise specification holds only for 10 MHz or 20 MHz external clocks.
Lock Range 9640A Wide 9640A Narrow 9640A-LPNX	 ±30 ppm ±1ppm ±0.3 ppm	On-screen lock indicator
Amplitude	1 V pk nominal	±5 V pk max
Input Impedance	50 Ω	Will accept TTL drive via a series 1 kΩ resistor - not provided
Lock Bandwidth 9640A Wide 9640A Narrow 9640A-LPNX	 1 kHz nominal 0.5 Hz nominal 0.5 Hz nominal	Phase Noise of output is determined by the incoming clock approaching or below this offset.

Note

External Reference I/O's are used to lock frequency synthesizers of two or more instruments (daisy chain). This eliminates offset and drift of frequency between instruments, allowing, for instance, a Spectrum Analyzer to accurately tune with respect to the Instrument. If they were not locked, the Analyzer and Instrument would be likely to drift off tune and the Analyzer could lose or not see the Instrument signal.

Instruments locked to the same Reference Frequency in this way can still exhibit very slight frequency offsets due to synthesizer / divider errors, and the two output frequencies will not be phase locked. (See description under Modulation Leveling and Frequency Pull Input Connector.)

Modulation, Leveling, Frequency Pull and Counter Input Connector

The Modulation, Leveling, Frequency Pull and Counter Input Connector is a BNC connection for applying a multifunction external control signal to the Instrument. Depending upon the operating settings of the Instrument, the signal may be tailored for modulation control, leveling control, frequency control, or Frequency Counter input.

If AM, FM, or Phase Modulation (PM) is in use, this input can be used to connect an external modulation source. In this case, the input is enabled via the Modulation Preferences screen and AC or DC coupling can be selected. See Table 3-3 and Table 3-4 for the input specifications.

If Leveled Sine is in use, this input will accept a dc feedback voltage from either of the following:

1. An external power meter – for external leveling of the signal at the power meter input. The feedback is compared with an internal adjustable reference voltage at the input of an error amplifier. The Instrument output level adjusts to minimize the difference. See Table 3-5 for the input specifications.
2. An external phase detector and error amplifier – for phase locking the output of the Instrument to that of another Instrument. In this case, this input is a voltage for controlling Instrument output frequency. Output frequency can be pulled by up to ±5 ppm, depending on sensitivity setting. See Table 3-6 for the input specifications.

If the integrated Frequency Counter (optional) is in use, this input will accept an ac voltage of the frequency to be measured. See Table 3-7.

⚠ Caution

To avoid damage to the load when using External Leveling, ensure that the maximum output level is suitably limited via the Leveled-Sine Preferences **screen.**

⚠ Caution

Connections to the External Modulation, Frequency Pull Counter and Leveling Input Connector will often be from a grounded source (e.g. Audio Signal generator or Power Meter). Such connection will ground the RF Common and hence the RF Output of the Product. In this circumstance, common-mode noise or ground loops may degrade performance at very low output levels.

Table 3-3. External Modulation Input Specifications (FM and PM)

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Frequency Range	DC – 1 MHz 10 Hz – 1 MHz	-3 dB Bandwidth, DC coupled -3 dB Bandwidth, AC coupled
Sensitivity FM	500 Hz – 19.2 MHz/V	Continuously adjustable
Sensitivity PM	0.001 – 96.00 rad/V	Continuously adjustable, maximum setting is carrier frequency dependent
Input Voltage	±2.0 V pk max.	Optimum input range ±0.25 to ±2.0 V pk, ±5 V pk absolute max.
Input Impedance	10 kΩ	Nominal

Table 3-4. External Modulation Input Specifications (AM)

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Frequency Range	DC – 220 kHz 10 Hz – 220 kHz 100 kHz max. for Carrier >125.75 MHz	-3 dB Bandwidth, DC coupled -3 dB Bandwidth, AC coupled
Sensitivity	0.5 - 400 %/V	Continuously adjustable
Input Voltage	±2.0 V pk max.	Optimum input range ±0.25 to ±2.0 V pk, ±5 V pk absolute max.
Input Impedance	10 kΩ	Nominal

Table 3-5. External Leveling Input Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Full Scale Voltage	1V – 5 V dc	Adjustable for different power meter types, ±5 V pk absolute max.
Input Impedance	10 kΩ	Nominal

Table 3-6. External Frequency Pull Input Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Input Voltage	±5 V dc.	±5 V pk absolute max.
Frequency Pull	±0.0001 ppm/V to ±1.0000 ppm/V	Polarity & Sensitivity adjustable.
Input Impedance	10 kΩ	Nominal

Note

When using External Frequency Pull to phase lock two signal sources over a wide range of carrier frequencies, it may be necessary to adjust Frequency Pull sensitivity. This parameter contributes to system loop gain and in some cases may need to be adjusted to maintain fixed Hz/V rather than ppm/V.

Table 3-7. Frequency Counter Input Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Input Voltage	±0.25 V – 5 Vdc	±5 V pk absolute max.
Frequency Range	10 Hz – 50 MHz	
Input Impedance	10 kΩ	An external 50 Ω thru terminator may be necessary at higher operating frequencies

Trigger I/O Connector

The Trigger I/O (input/output) connector is a rear-panel BNC connection that is configurable as either an input or an output for sweep trigger signals, and as an output for modulation trigger signals. In either case, this port is TTL compatible. Sweep trigger input and output specifications for the port are shown in Tables 3-8 and 3-9, respectively. Modulation trigger output specifications are shown in Table 3-10.

Note

I/O connections to the Trigger I/O connector will often be grounded (e.g. Oscilloscope or Spectrum Analyzer). Such connection will ground the RF Common and hence the RF Output of the Instrument. In this circumstance, common-mode noise or ground loops may degrade performance at very low output levels.

Table 3-8. Sweep Trigger Input Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Trigger Amplitude	TTL , +5 V pk max	Selectable as rising or falling edge
Input Impedance	10 kΩ	Nominal
Time alignment	≤1 ms Typical	To start of sweep

Table 3-9. Sweep Trigger Output Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Output Pulse	TTL (3 V)	Selectable as rising or falling. Typical duration 250 µs
Time alignment	+14 to +16 ms when sweep dwell time ≥20 ms, +1 ms when dwell time <20 ms, typical.	From start of sweep (delay ensures settled signal level at the trigger point)

Table 3-10. Modulation Trigger Output Specifications

Parameter	Specification	Comments
Connector Type	BNC	Input referenced to RF Common (floating)
Output Pulse	TTL (3 V)	Selectable as rising or falling edge
Time alignment	±500 ns Typical	From modulation waveform zero crossing (Sine) or positive peak (Triangle)

Operating the Instrument

This section of the manual contains operating instructions for the Instrument. Before using these instructions, read the descriptions of the controls, indicators, and connectors provided earlier in this chapter. These descriptions are sufficient to familiarize the user with most of the general processes for operating the Instrument. These earlier descriptions provide all of the information necessary to access, edit, and interpret general screen information.

Before Starting

Before proceeding with the instructions in this section, complete the following procedure:

1. Prepare the Instrument for operation. See Chapter 2.
2. Learn the function of and how to use each of the controls, indicators, and connectors described earlier in this chapter.
3. Account for any rear-panel connections that may be required.
4. Set the power switch to on and set the Instrument to Standby (press STBY).

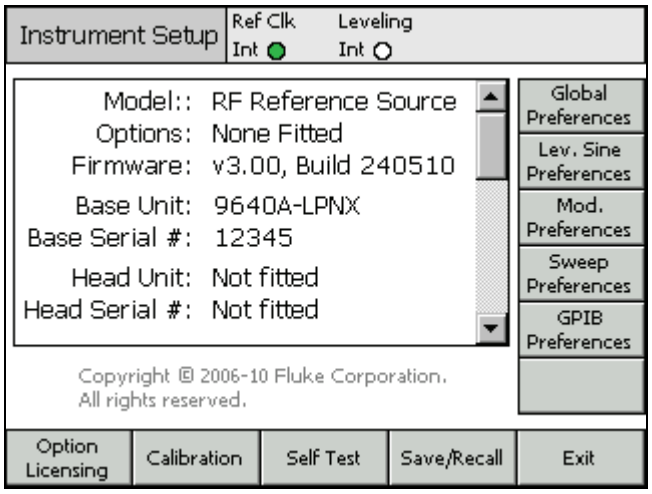
   Approximately 4 seconds after switching on power, the Instrument runs a self-test. Details of the power-on self test are given earlier in Chapter 2.

Setting Global Preferences

The Instrument setup screen describes the basic instrument configuration and gives the user access to all user preference setup screens.

Use the following procedure to set the global preferences:

1. Press SETUP ; the Instrument Setup screen appears.



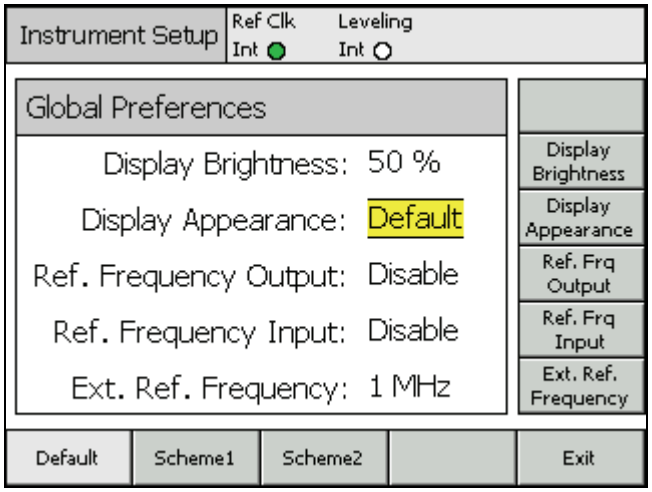
ead05f.bmp

Instrument Setup

2. Press the Global Prefs softkey to the right of the display. The Global Preferences screen appears.
3. Select each of the fields, and enter the desired preference in each.

See Table 3-11 for a list of the available global preferences.

Table 3-11. Global Preferences



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Field	Preference
Display Brightness	10 to 100 % (1 % steps)
Display Appearance	Default, Scheme 1, Scheme 2
Reference Frequency Output	Disable, 1 MHz, 10 MHz
Reference Frequency Input[1]	9640A: Disable, Wide, Narrow 9640A-LPNX: Disable, Enable
External Reference Frequency	1 MHz to 20 MHz (1 MHz steps)

[1] Selects the source of the reference frequency and on 9640A-STD, the pull range available, Wide or Narrow. 9640A-LPNX requires a reference within ±0.3ppm. 9640A-STD requires a reference within ±30ppm (Wide) or within ±1ppm (Narrow).

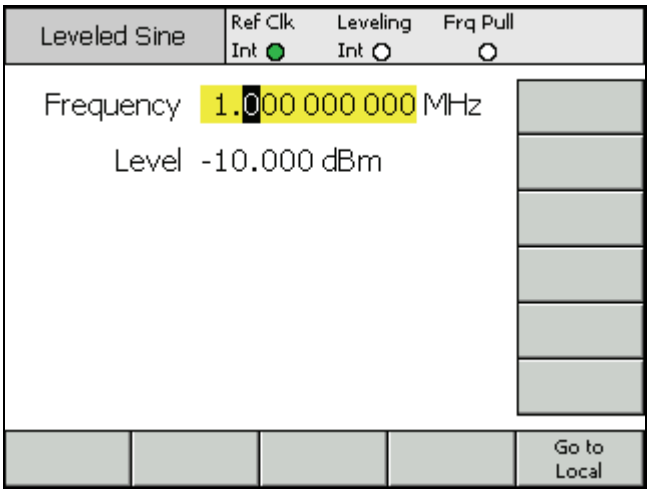
Local or Remote Operation

Manual user interaction at the front panel of the Instrument is considered local operation. Remote operation requires the use of remote data supplied to the Instrument by way of an IEEE 488 connection at the rear panel. Chapter 4 of the *9640A/9640A-LPNX Instruction Manual* provides all of the information required to remotely operate the Instrument.

There is no physical switch for selecting remote operation. In fact, the Instrument switches to remote operation when it receives a remote instruction and remains there until it is recalled to local operation. This recall may occur because of sending a remote instruction or because of manually pressing the Go to Local softkey at the bottom of the display.

While the Instrument is set to remote operation, all of the front panel (local) controls are locked out (inoperable) with the exception of the Go to Local softkey. See the following Leveled Sine screen.

If the Go to Local softkey appears at the bottom of the display, press it to return to local operation.



ead97f.bmp

Leveled Sine – Remote Operation

GPIB Command Emulation

The Instrument has the capability of responding to the GPIB remote commands of certain legacy signal generators. To achieve this, the Instrument must be switched to an alternative Emulation Personality, each of which will have its own GPIB bus address. An emulation personality for the HP3335 signal generator is provided as standard with the Instrument. Other emulation personalities are available as purchased options and are enabled by entering a License Key. However, when available, time limited emulation personalities are fitted as standard, allowing the user to evaluate their effectiveness on a try-before-buy basis.

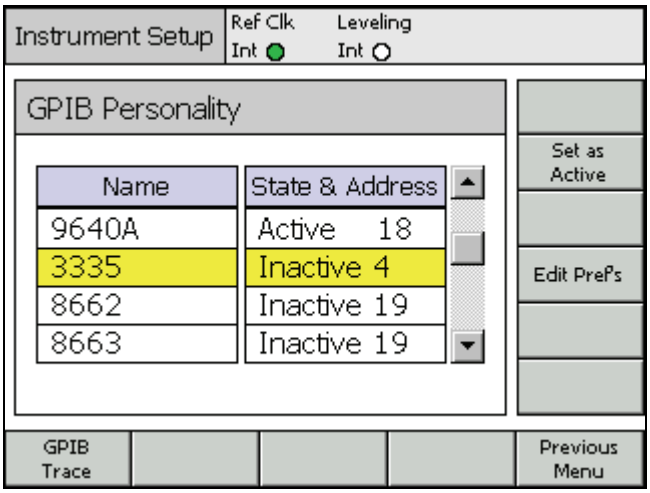
Note

The Instrument will not respond to the 9640 GPIB commands when an emulation personality is selected.

Selecting and Changing the Address of a Command Emulation

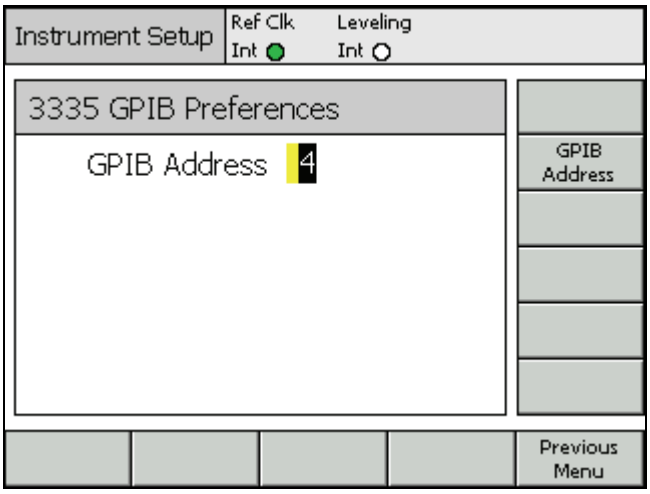
Use the following procedure to select or deselect a GPIB personality or to change the GPIB Address of the Instrument or of an emulation personality:

1. From the Setup screen, press the GPIB Preferences softkey to display the GPIB Personality screen. This screen displays the available GPIB personalities, their status, Active or Inactive, and their current GPIB address. Only one personality can be Active.
2. Use the scroll wheel or the ⏶⏷ keys to highlight a GPIB personality.
3. Press the Set as Active softkey to change the current GPIB Personality.



ead260f.bmp

4. For any highlighted GPIB personality, the current GPIB address may be updated by pressing the Edit Pref's softkey. This action causes the relevant GPIB Preferences screen to display.
5. If necessary, use the GPIB Address softkey to highlight the Address field.
6. Use the scroll wheel, ⏶⏷ keys, or the keypad to enter a new address. This can be the same address as another personality as only one will be Active.



ead261f.bmp

Note

The Instrument cannot emulate two emulation personalities simultaneously. Therefore, in theory, it would not be possible to replace two legacy signal generators within a Calibration System and hope to emulate them both. However, Fluke has found that many Calibration Software and Procedures do not address two instruments simultaneously. In these cases, it is possible to switch 9640A emulation personality via the Keyboard Interface at the procedure lead-change points.

Note

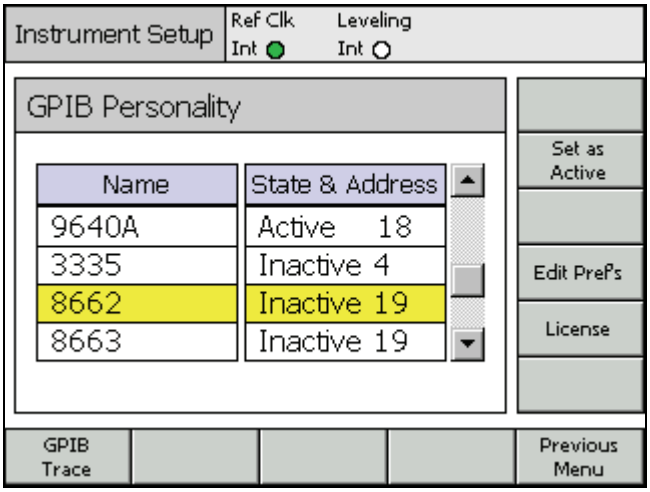
Fluke has extensively tested the Instrument's GPIB command and its functional emulation of legacy signal generators, and will support Customers in resolving any unforeseen difficulty. However, Fluke does not guarantee that complete and accurate emulation will be possible for all Systems, Software, and Procedures that may be encountered.

Licensing Status a GPIB Emulation Personality

A license for the HP3335 Emulation Personality is included as standard on the Instrument. Other GPIB personalities require a License Key, which may be purchased with the instrument or as a later upgrade. A Temporary License is factory installed to allow evaluation of the command emulation prior to its purchase. This Temporary License allows a set number of hours of Remote operation. The clock starts when the instrument is using the relevant emulation personality and then switched to remote control by the GPIB. The clock stops when Local Operation is restored either by the GPIB or by pressing the Go to Local softkey.

Use the following procedure to install a GPIB personality License Key:

1. From the Setup screen, press the GPIB Preferences softkey to display the GPIB Personality screen. This action causes the display to show the available GPIB personalities, their status (Active or Inactive), and their current GPIB address. Only one personality can be Active.
2. Use the Spin Wheel or the ⌃⌄ keys to highlight a GPIB personality.



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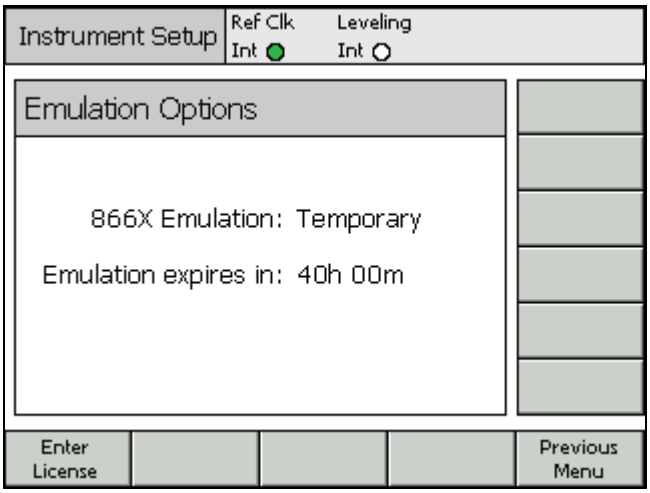
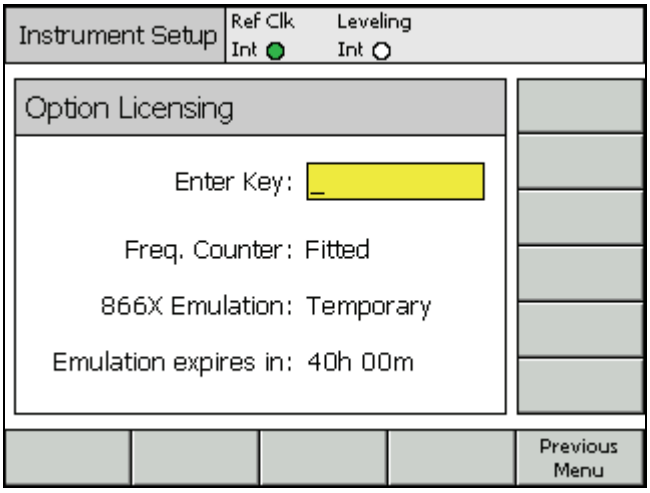
3. To show the current License screen (status) for the highlighted GPIB personality, press the License softkey.



ead263f.bmp

4. On the relevant License screen press the License Key softkey to display the License Key Entry screen.



ead264f.bmp

5. Using the alpha/numeric keypad, enter the License Key provided. The *Keypad* section (provided earlier in this chapter) explains the use of the alpha/numeric keypad. If the entered License Key is rejected, an error message appears in the status bar.

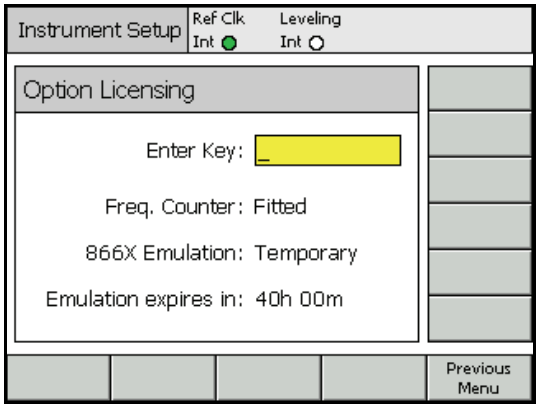
Full details of operation and programming via the 9640A GPIB and emulation personalities are given in Chapter 4 of the *9640A/9640A-LPNX Instruction Manual*.

Licensing Instrument Options

Some instrument options are enabled by purchasing a License and entering a License Key. The example of a GPIB Personality has been introduced above. Licenses and Keys are purchased through a Fluke Sales Representative or Customer Service channel. To enter the License Key:

1. From the Setup screen, push the Options Licensing softkey to display the License Entry screen. This causes the display to show the available Licensable Options and their status (Fitted, Not Fitted or Temporary).
2. Using the alpha/numeric keypad, enter the License Key provided. See the Keypad section, provided earlier in this chapter, for more information. If the entered License Key is rejected, an error message appears in the status bar.

Full details of operation of and programming via the options are given in Chapter 3 and 4 of the *9640A/9640A-LPNX Instruction Manual*.



ead264f.bmp

Connecting a Leveling Head to the Instrument

⚠ Caution

The 9640A front-panel connector interface is suited only for use with Fluke 9640A-xx Leveling Heads. To avoid equipment damage, no other connection is permitted.

Note

Background: The 9640A-xx Leveling Head contains a small EEPROM device in which the head type, serial number, and calibration data is stored. When a Leveling Head is fitted, it is automatically detected and the stored data is read. The head type, 9640A-50 (50 Ω) or 9640A-75 (75 Ω), will be used to re-scale User Interface values in accordance with the capabilities of the Leveling Head and may, therefore, cause displayed level values to change.

Hot (power on) swapping of Leveling Heads is fully supported and will not cause damage or RF leakage. The Hot removal of a Leveling Head will, however, force the Instrument output into Standby.

The Base Unit and Leveling Heads are calibrated together, and details of the association are stored in both the Base Unit and Leveling Heads. Connecting a Head not associated with the Base will result in a warning message being displayed, but normal operation will not be prevented. Details of the Base/Head associations can be displayed by pressing the Setup *key, followed by the* Calibration *softkey.*

Use the following procedure to connect the cable end of the Leveling Head to the RF Output connector on the Instrument:

1. Remove the plastic connector protection caps from the cable-end connectors and save them for future use.
2. Refer to Figure 3-5, and connect the multiway connector to the Leveling Head Control connector on the Instrument. Press firmly on the multiway connector until it latches.
3. Refer to Figure 3-5, and connect the SMA connector with the RF Output connector on the Instrument.
4. Torque the connector to 0.45 Nm (4 in-lb) using an SMA connector torque wrench.

   The torque wrench is available as an accessory; see Chapter 1, *Options and Accessories List*.

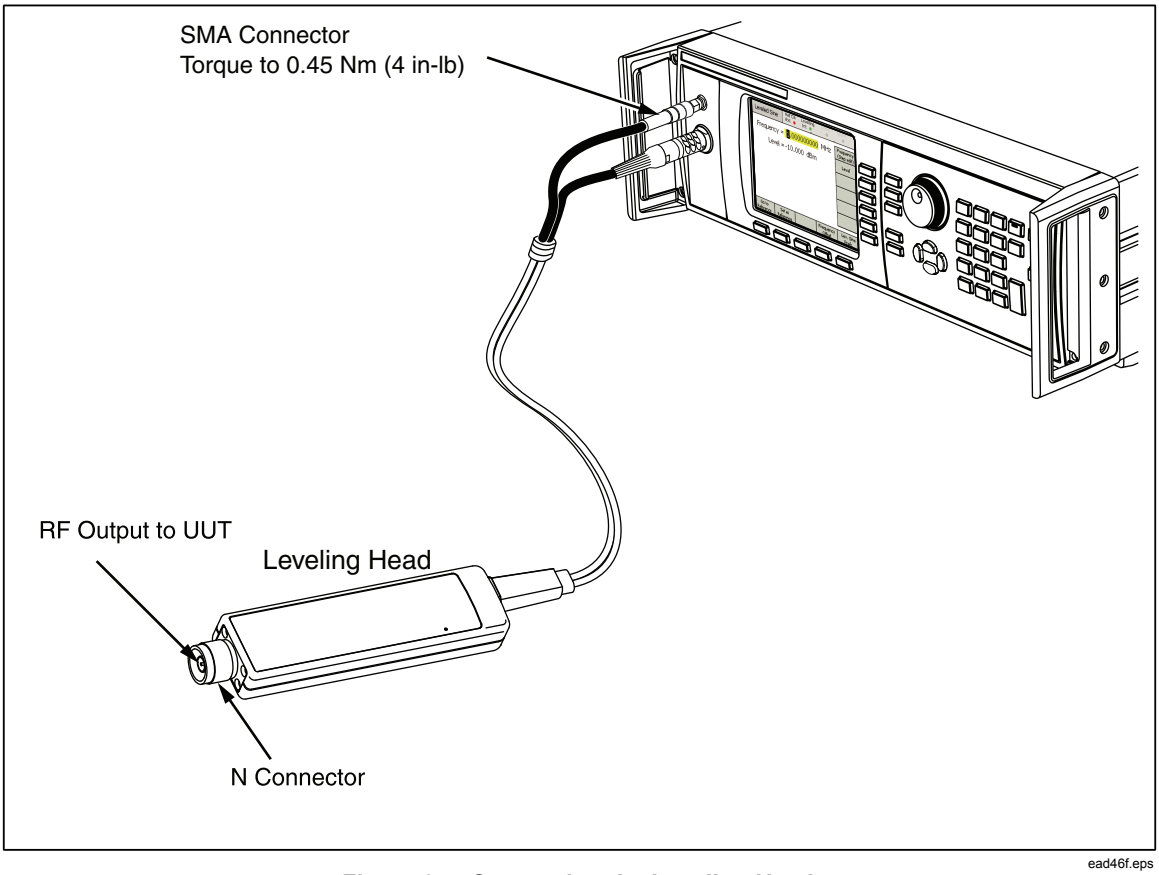


Figure 3-5. Connecting the Leveling Head

Connecting a Leveling Head to a Unit Under Test

The Instrument relies on either a 50 Ω or a 75 Ω Leveling Head to maintain the integrity of the output signal. Both Leveling Heads use N connectors to connect to the input of the UUT.

Connecting the Leveling Head to a UUT is a straightforward, but critical, process. Before making the connection, to avoid damage to the instruments involved and to ensure measurement integrity read and observe the following cautions and warnings,.

⚠ Caution

To prevent damage to the N connector on the Fluke 9640A-xx Leveling Heads, use a sacrificial adapter when making frequent connections or connections to low-quality N connectors.

⚠ Caution

Reliable and repeatable interconnections are only achieved at the specified torque setting of 1.00 Nm (9 in-lb). Performance will be impaired if torque settings are not observed, and permanent connector damage is likely to result from over-tightening.

⚠ Warning

To prevent the leakage or transmission of an RF signal, never connect the Product output (the output from a Leveling Head) to a radiating antenna of any kind. Such a transmission would be hazardous to personnel and may impair the SAFE operation of equipment, and communication and navigation systems.

The connection of a radiating antenna is an illegal act in many countries. Only connect the Product output (the output from a Leveling Head) to equipment or transmission lines designed to prevent RF leakage at the level and frequency of the Product output.

⚠ Caution

The Leveling Heads are fitted with close tolerance metrology-grade N-connectors compliant with MIL-C-39012 and MMC Standards for Precision N-connectors. Used in demanding metrology applications, the Leveling Heads are likely to be mated with similar high-quality connectors, minimizing the opportunity for wear and damage. However, in applications that require frequent mating or mating to lower quality connectors, the opportunity for damaging the connectors increases. On these high-risk occasions, consider using a sacrificial adapter to prevent damage to the N-connectors.

⚠ Caution

Irreversible damage of RF connectors is likely if 50 Ω and 75 Ω connectors are accidentally mated to each other. Although appearance is similar, the dimensions (pin diameter) of 75 Ω connectors differ significantly from those of 50 Ω. Improper mating of 50 Ω and 75 Ω connectors will damage the center pin. Great care must be taken to ensure that the 9640A-50 is mated only to 50 Ω systems and likewise that the 9640A-75 mates only with 75 Ω systems. Otherwise, mechanical damage to the connectors and out-of-tolerance performance is likely.

⚠ Caution

The 9640A-xx Heads are fed via very high-grade flexible coaxial transmission line. As with any coaxial line, deformation of sidewalls or abrupt bending can degrade performance. Take care to avoid mechanical stress or tight bend radius <60 mm (2.4 in).

⚠ Caution

The maximum output level of the 9640A is unusually high (+24 dBm into 50 Ω and +18 dBm into 75 Ω). Many RF loads, active and passive, could be damaged by this power level. Be careful not to exceed the maximum ratings of the any connected load.

Additional notes regarding good practice when sourcing and measuring high- and low-level signals are given at the end of this chapter.

Use the following procedure to connect a Leveling Head to a UUT:

1. Read and observe all of the preceding Cautions and Warnings.
2. Remove the plastic connector protection caps form the cable-end connectors and save them for future use.
3. Connect the N-connector on the Leveling Head to the input of the UUT.
4. Torque the N-connector to 1.00 Nm (9 in-lb) using an N-connector torque wrench.

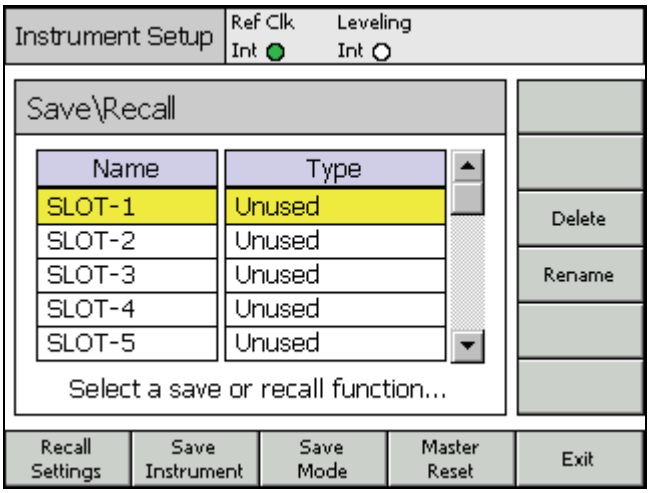
   The torque wrench is available as an accessory; see Chapter 1, *Options and Accessories*.

Using the Save/Recall and Master Reset Function

The Save/Recall function provides the user with a way to save and recall up to 10 groups of settings associated with the instrument setup and/or the output signal.

Each memory group has a default name, SLOT-1 through SLOT-10, and is accessible from the Instrument Setup screen. From this screen, the user can do the following:

- Save the present Instrument or output signal settings to a selected slot
- Recall previously saved instrument or output signal settings from a selected slot
- Rename a selected memory slot to something more meaningful
- Delete all setting information from a selected memory slot
- Recalling the default (power-on default) condition for the user interface settings



ead11f.bmp

Save/Recall Screen

Accessing the Memory Screen

To access the Save/Recall screen press SETUP . When the screen initially comes up it is ready to perform save/recall operations on the selected (SLOT-1) memory. These operations include Rename, Delete, Save Instrument, Save Mode, and Recall Settings. A description of each operation follows:

Rename	Rename the selected memory location to something more meaningful.
Delete	Delete the settings from the selected memory.
Save Instrument	Saves the basic instrument settings, that is, those settings assigned to the vertical softkeys on the initial Instrument Setup screen (press SETUP to view these keys).
Save Mode	Saves the present output settings for one of the output modes: Sine, Modulated, or Swept. Savings do not include the basic instrument settings.
Recall Settings	Immediately recalls and applies the settings associated with the selected memory (slot).
Master Reset	Immediately recalls the power on default settings for the Instrument user interface. Master Reset is equivalent to the GPIB command *RST.

The following Save/Recall procedures are all initiated from the Save/Recall screen. Press SETUP to access the screen.

Making a Memory Selection

After calling the Save/Recall screen, the first step in using the Save/Recall function is to select one of the 10 memory slots. By default, the first slot is selected (yellow high light) when the Save/Recall screen appears. Use either the Spin Wheel or the ⌃ ⌄ keys to scroll through the slots and make a selection.

Renaming a Selection

By default, the 10 available memory slots are named SLOT-1 through SLOT-10. Any one or all of the slots may be renamed to something more meaningful. Use the following procedure to rename a slot:

1. From the Save/Recall screen, select the slot to be renamed.
2. Press the Rename softkey. A 10 character prompt appears at the bottom of the list.
3. Use the Keypad to enter a new name for the slot. The name may be any combination of up to 10 alphanumeric characters.
4. When the new name is correct, press ENTER to transfer the new name to the slot.

Deleting a Selection

To delete the settings previously saved to a memory slot, select the slot and press the Delete softkey. The deleted settings revert to a default or Unused state (Unused is displayed in the selected slot). Recalling settings from an unused slot has no effect on the Instrument.

Saving an Instrument setup

Settings that apply to the instrument setup include those setting that apply to the instrument but not those that define the output signal. For example, all of the preferences settings are instrument setup settings. Use the following procedure to save a set of instrument setup settings to a memory slot:

1. From the Save/Recall screen, select a slot for saving the instrument setup settings.
2. Press the Save Instrument softkey. If the memory slot contains previously saved settings, the screen prompts for overwrite permission (Yes or No). Pressing the Yes softkey saves the new settings, and the Type column in the selected slot field displays Instrument (xx) to identify the settings as instrument setup settings. Pressing the No softkey aborts the save attempt.

Saving Settings for an Output Function

Settings that apply to the output function include those settings that directly affect the output signal, but not those that apply to the instrument setup. For example, all of the settings that contribute to defining a sine output are output function settings. Use the following procedure to save a set of output function settings:

1. From the Save/Recall screen, select a slot for saving the output function settings.
2. Press the Save Mode softkey. Three new soft labels are displayed: Save Sine Mode, Save Sweep Mode, and Save Mod. Functions.
3. Press the appropriate softkey. If the memory slot contains previously saved settings, the screen prompts for overwrite permission (Yes or No). Pressing the Yes softkey saves the new settings, and the Type column in the selected slot field displays the mode to identify the settings as output function settings. Pressing the No softkey aborts the save attempt.

Recalling Settings

Any one of the 10 saved settings may be recalled at anytime. Use the following procedure:

1. From the Save/Recall screen, select the slot containing the settings to be recalled.
2. Press the Recall Settings softkey. The instrument immediately responds to the new settings.

Creating an RF Output Signal

The Instrument provides three kinds of output signals: sine, modulated, and swept. User selectable screens, as shown in Figure 3-6, provide control for each of these outputs.

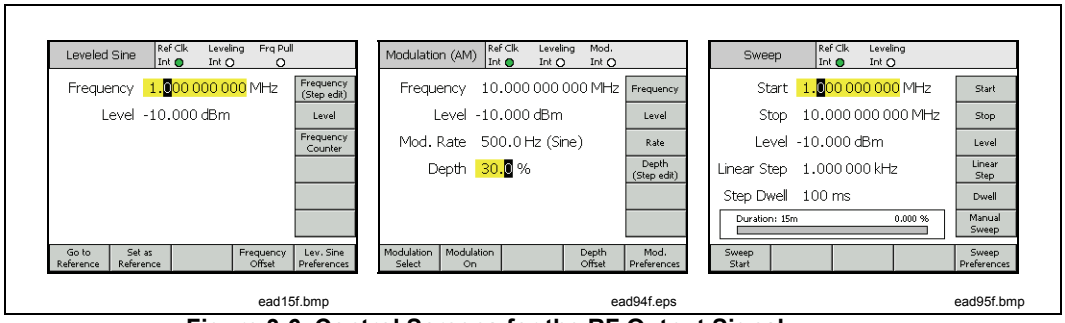


Figure 3-6. Control Screens for the RF Output Signal

The remaining sections in this chapter provide the procedures for creating sine, modulated, and swept output signals. An appropriate screen facsimile and a table containing a breakdown of the fields accessible on the screen complement each of the procedures. Procedures for expanded features, such as offset, are presented separately.

Note

Entries displayed in parentheses in the soft labels indicate what will show in the field after a button is pressed, not what the field currently shows. For example, if the label indicates Frequency (Step edit)*, the* Frequency *field is showing* Cursor edit*.*

Note

Many of the data fields in the following procedures include the opportunity to define measurement units (using the UNITS *key). Since the units are often preferential, it is left to the user to define them. Instructions to do so are not given in the following procedures.*