



Proposal for San Marcos Electric Utility

SMEU FLT-FLR System

SEL ES Project #: 020787.000.00 (Rev. 2)

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Document Revision Table

Rev.	Issue Date	Notes
0	08-15-2019	Initial Issue
1	01-08-2020	Added FLT-FLR in to SEL ES scope of supply
2	9/28/2021	Extended Valid date for 90 days

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1 Scope of Services

SEL Engineering Services, Inc. (SEL ES) is providing this document in response to a request for SEL Fault & Load Transmitter and Receiver (SEL FLT-FLR) system path study and validation, by Jerome Vernon of San Marcos Electric Utility (SMEU).

Service Description	Price (USD)
<p>Item 1: SEL FLT-FLR system path study</p> <p>SEL ES will conduct a wireless path study for communication to fifty (50) sites/locations where installation of the SEL FLT is planned by the customer. The customer is required to supply the necessary information required for the path study. The following information is needed for each proposed SEL-FLR installation site.</p> <ul style="list-style-type: none"> • Antenna latitude • Antenna longitude • Antenna to radio cable length • Antenna height • Any known obstructions <p>The following information are needed for each proposed SEL-FLT installation site</p> <ul style="list-style-type: none"> • Latitude • Longitude • Transmitter height • Any known obstructions <p>SEL ES will also assist the customer in designing the FLT-FLR system network by providing recommendations based on path studies and site validation. This will include the recommendations for additional FLR sites as necessary to provide coverage to proposed FLT sites. The Customer is responsible for providing details on additional possible FLT installation sites as necessary.</p> <p>This is an in-office work and this support will be provided on a Time and Expense basis. If additional time and expense is needed, a change order will be required. See Section 3.2 for SEL Time and Expense rates.</p>	<p>\$24,159.00 (Time & Expense)</p>
<p>Item 2: SEL FLT-FLR system path study onsite validation</p> <p>To ensure the successful communication of SEL FLT-FLR system, site validation of path study report is required. SEL ES will provide up to five (5) man days of onsite support by two (2) engineers to validate the path study report (total of ten (10) man days) through a combination of site surveys and onsite testing. The SEL-FLR and associated antenna/cable will need to be installed for each chosen FLR site prior to onsite testing by the Customer. It is assumed that all the FLT-FLR locations are in the San Marcos, TX area and within 100-mile radius. SEL ES expects to complete the validation in two (2) trips and four (4) mobilizations are included in the cost.</p> <p>This support is provided on a per diem basis and Customer will only be charged for the actual man days of onsite support</p>	<p>\$33,600.00 (Per Diem)</p>
<p>Item 3: Hardware</p> <p>SEL ES will provide the following hardware:</p> <ul style="list-style-type: none"> • Quantity one hundred and fifty (150) SEL-FLT Fault and Load Transmitters (SEL-FLT). • Quantity two (2) SEL-FLR Fault and Load Receivers (SEL-FLR). • Quantity two (2) omni directional antennas. 	<p>\$133,912.00 (Fixed Fee)</p>

<ul style="list-style-type: none"> Quantity two (2) coaxial cables of length 280 FT. Quantity two (2) power supplies for SEL-FLR. Quantity two (2) Radio Surge Protector with N Female Connectors. <p><i>Note: Additional FLRs may be required for implementation which can be identified during path studies. The part# selected for antennas are for estimation purpose only and may need to be changed during the detail design.</i></p>	
<p>Item 4: FLT-FLR Configuration</p> <p>SEL ES will configure the SEL-FLT/FLR for DNP communication in the office before shipping to the Customers sites. The FLR will be configured to send data to Customer SCADA system using DNP IP protocol. SEL ES will supply the points list along with recommended communication parameters.</p>	<p>\$8,266.00 (Time & Expense)</p>
Total	\$199,937.00

All quoted prices are exclusive of any sales, value-added, or similar taxes, which will be added, if applicable, at the statutory rate(s) at the time of invoicing.

1.1 Deliverables to Customer

1.1.1 Equipment

SEL ES will provide the following equipment to San Marcos Electric Utility (“Customer”):

- ~~None.~~
- Quantity one hundred and fifty (150) SEL-FLTs. SEL Part# FLT-1000.
- Quantity two (2) SEL-FLR’s. SEL Part# FLR-1000.
- Quantity two (2) omni directional antennas. SEL Part# 235-0234.
- Quantity two (2) coaxial cables of length 280FT. SEL part# C978-280.
- Quantity two (2) power supplies for SEL-FLR. SEL part# 240-0056.
- Quantity two (2) Radio Surge Protectors with N Female Connectors. SEL Part# 200-2004.

1.1.2 Documentation

SEL ES will provide the following documentation to the Customer:

- A final path study report in .pdf format for the Customer to review and approve.
- A final path study validation report on .pdf format for the Customer to review and approve.
- Points list for DNP communication.

1.2 Deliverables to SEL ES

The Customer will provide the following items to SEL ES:

- Information specified in Item 1 of service description.
- Any pertinent information to complete path studies.

1.3 Change in Scope

In the event of a change in scope, the contract amount and schedule shall be equitably adjusted. The party identifying a potential change in scope will request the change of scope to the other in writing (fax, email, or letter). SEL ES will identify any budget or schedule impact and submit it for approval. SEL ES will proceed with the work as soon as SEL ES receives written approval, in accordance with established contract provisions.

2 Payment and Work Schedule

2.1 Purchase Order Instructions

We request that the Customer consider the following when issuing a Purchase Order (P.O.). This will ensure that SEL ES, Inc. is able to accept the P.O. and the project team is able to provide a timely commitment to the project schedule:

Purchase Order must be made out to SEL Engineering Services, Inc. SEL Engineering Services, Inc. represents the services and solutions provider division of Schweitzer Engineering Laboratories, Inc. (SEL).

- Purchase Order must reference SEL standard T&Cs, or previously agreed contract T&Cs.
- Purchase amount must be for full amount of proposed project plus any selected options.
- Purchase Order can be issued to the contact(s) listed in the SEL ES Contact Information section in this proposal.

2.2 Payment Milestones

Milestone Activity	Price (USD)
1. Total T&E - Invoiced Monthly	\$32,425.00
2. Up on Ordering of Equipment	\$66,956.00
3. Up on Receiving of Equipment	\$66,956.00
4. Total Per Diem - Invoiced Monthly	\$33,600.00
Total	\$199,937.00

All quoted prices are exclusive of any sales, value-added, or similar taxes, which will be added, if applicable, at the statutory rate(s) at the time of invoicing.

For time and expense (T&E) projects, please see Table 1 in Section 3. T&E projects will be invoiced monthly.

Unless indicated otherwise in this proposal, the price does not include the cost of any payment, performance, and/or warranty security instrument.

This proposal is valid for 90 days. SEL ES reserves the right to withdraw this offer if mutually accepted credit terms cannot be agreed upon.

2.3 Payment and Credit Terms

If your company does not have established credit terms sufficient to cover this purchase, SEL ES reserves the right to require any of the following: credit information, prepayment, letter of credit, or progress payments prior to acceptance.

Work cannot be initiated until adequate credit terms have been established.

Payment Terms: Net 30 days after date of invoice.

2.4 Schedule

SEL ES will furnish a schedule for engineering, drawings for approval, manufacture, test, and shipment within one week after receipt of a purchase order and agreed upon terms.

Failure to supply requested information in a timely manner will affect the schedule and will subject the Customer to additional charges as set forth in Section □. If a project is delayed or suspended, the revised project schedule will be based on present workload and staff availability.

Proposed schedules are based on present workloads and, if applicable, material and equipment deliveries. The schedule may change depending upon the start date and the impact of work that may be awarded to SEL ES between the date of this proposal and the date of the award.

Schedule is subject to acceptable payment and credit terms.

The schedule will be equitably adjusted in the event of changes in scope or in the event of delays attributable to the Customer or Customer's separate contractors, unforeseen conditions, or causes beyond the control of SEL ES.

2.5 Work Suspension

2.5.1 Demobilization and Remobilization

In the event that a delay involves a demobilization and remobilization, whether the same is due to a Customer request, a lack of information, Customer has been unresponsive for 30 days, or otherwise, SEL ES will charge and the Customer agrees to pay the greater of \$1,000 or 5% of the contract value to demobilize from the Project.

After the Project has been demobilized, SEL ES will charge and the Customer agrees to pay 2% of the contract value to remobilize the project per Customer directive and per a mutually approved schedule. If a project is remobilized, the revised project schedule will be based on present workload and staff availability.

2.5.2 Suspension of Work

Any Project delayed or demobilized beyond a reasonable period (as determined in SEL's sole discretion and including, but not limited to, the Customer being unresponsive for 30 days or the project being suspended for a period of 180 days or more) shall be treated as terminated by Customer and Customer shall be responsible for payment of all outstanding invoices, any actual costs incurred up to the date of termination, and a 20% cancellation fee on the remaining unbilled balance.

3 Clarifications and Exceptions

SEL ES developed the scope of work, schedule, and price based on the information provided to us as listed in this proposal. Should additional or changed work be required, including such work resulting from unusual conditions or for any other reasons that are not evident from the information provided, changes to the price or schedule may result.

SEL ES will assign a project manager to the project. The project manager will oversee and maintain the schedule within SEL ES. The project manager will also be the point of contact with the Customer in order to maintain a smooth flow of information.

For safety reasons, SEL ES service personnel will not plan to work more than 10 hours per day. Should job requirements dictate work hours in excess of 10 hours per day, SEL ES and the Customer must review the requirements and agree on an appropriate plan that addresses safety concerns and the reasonableness of the hardship that the excessive hours place on SEL ES personnel.

3.1 Clarifications

- SEL ES will make recommendation for the successful installation and communication of SEL FLT-FLR system based on path study and site validation.
- Changes in equipment part#, count, or engineering may require a change order to complete the scope of work.
- It is understood that the Customer will install the SEL-FLT/FLRs and all the accessories including antennas at designated locations.
- It is understood that the Customer will provide the filed verification support including lineman's bucket truck and operators.

3.2 Time and Expense Additional Work

SEL ES will perform additional work on a time and expense (T&E) basis, unless the Customer and SEL ES agree on other arrangements. The party identifying a potential change in scope will request the change of scope to the other in writing (fax, email, or letter). SEL ES will identify any budget or schedule impact and submit it for approval. SEL ES will proceed with the work as soon as SEL ES receives written approval, in accordance with established contract provisions.

Work performed on a T&E basis will be in accordance with the schedule of charges shown in Table 1, **unless specifically modified in this proposal.**

Table 1 T&E Rate Tables (USD)

Role	Weekday (per hour)	Weekday Overtime (per hour)	Saturday (per hour)	Sunday/ Holiday (per hour)
Consultant Principal Engineer	\$285	\$428	\$428	\$570
Senior Engineer	\$210	\$315	\$315	\$420
Project Engineer III	\$175	\$263	\$263	\$350
Project Engineer II Senior Specialist Senior Relay Commissioning Technician	\$160	\$240	\$240	\$320
Project Engineer I Specialist III Relay Commissioning Technician III Project Controller II & III Senior Designer	\$140	\$210	\$210	\$280
Designer III Specialist II Project Controller I	\$125	\$188	\$188	\$250
Associate Project Engineer Relay Commissioning Technician II Field Service Technician III	\$120	\$180	\$180	\$240
Designer II Specialist I	\$115	\$173	\$173	\$230
Designer I Relay Commissioning Technician I	\$95	\$143	\$143	\$190
Drafter Account Administrator III Field Service Technician II	\$85	\$128	\$128	\$170
Account Administrator I & II Administrative Field Service Technician I Engineering Intern	\$75	\$113	\$113	\$150

All quoted prices are exclusive of any sales, value-added, or similar taxes, which will be added, if applicable, at the statutory rate(s) at the time of invoicing.

The following details apply to Table 1:

- The T&E rate is the charge per person, per hour. Typical working hours are 8 a.m. to 6 p.m., Monday through Friday. Lunch shall be up to 60 minutes with two 15-minute breaks each day. Onsite work outside of typical working hours shall be agreed upon between the Customer and SEL ES in advance and be subject to additional charges.
- Overtime is defined as time in excess of 8 hours per day or any hours worked Saturday or Sunday. Overtime will be billed at the rates shown in Table 1.
- Onsite T&E invoices will include billable project administration and project management time not performed on site.
- The hourly rates quoted include the use of personal computers loaded with Microsoft Office, Lotus Notes, MATLAB, Mathcad, AutoCAD, MicroStation, and SEL software used in the preparation, documentation, and processing of settings for SEL products.
- SEL ES does not bill for long-distance telephone, fax, low-volume copying, and document shipping charges.
- Hourly rates are valid for work performed within one year of the proposal date.
- Holidays observed for U.S. Offices include: New Year’s Day (observed), Memorial Day, Independence Day (observed), Labor Day, Thanksgiving Day, Thanksgiving Friday, and Christmas Day (observed).

3.3 Per Diem

SEL ES will perform onsite work on a per diem basis, unless the Customer and SEL ES agree on other arrangements. The party identifying a potential change in scope will request the change of scope to the other in writing (fax, email, or letter). SEL ES will identify any budget or schedule impact and submit it for approval. SEL ES will proceed with the work as soon as SEL ES receives written approval, in accordance with established contract provisions. Refer to Table 2 for the per diem rates.

Table 2 Per Diem Rate Table (USD.)

Item	Description	Price (USD)
1	Mobilization fee per U.S. personnel	Distant (requires air travel) = \$4,500 Local (within 200 miles) = \$2,400
2	Daily rate per U.S. personnel	Weekday rate = \$2,400/day Saturday rate = \$3,100/day Sunday and holiday rate = \$4,000/day

All quoted prices are exclusive of any sales, value-added, or similar taxes, which will be added, if applicable, at the statutory rate(s) at the time of invoicing.

The following details apply to Table 2:

- No receipts will be provided as part of the per diem rates.

- The mobilization fee is defined to include the labor and travel costs associated with transporting one person roundtrip to and from the Customer site.
- The daily rate is the charge per person, per day. Typical working hours are 8 a.m. to 6 p.m., Monday through Friday. Lunch shall be up to 60 minutes with two 15-minute breaks each day. If all the onsite work cannot be performed during typical working hours, then the daily per diem rate will be billed at 1.5 times the above rate for work performed Monday through Friday. Onsite work performed on Saturday or Sunday shall be agreed upon between the Customer and SEL ES in advance and be subject to additional charges.
- Time spent by SEL ES personnel on site while waiting standby, training, or traveling to and from the site will be considered billable time.
- Per diem rates are valid for work performed within one year of the proposal date.
- Holidays observed for U.S. Offices include: New Year's Day (observed), Memorial Day, Independence Day (observed), Labor Day, Thanksgiving Day, Thanksgiving Friday, and Christmas Day (observed).

3.4 Onsite Commissioning Support

Onsite commissioning support is provided as part of this proposal and does not include installation or wiring. For this support, the SEL ES engineer will work under the direction of the Customer's engineer in charge and will assist with technical issues that arise during commissioning regarding SEL devices. The engineer in charge will be responsible for providing and operating required test equipment. The SEL ES engineer will follow operational and safety procedures governing the work site but will not be responsible for enforcing operations and safety procedures, the direct supervision of personnel, or taking or releasing system clearances.

Delays in project completion, or noncompletion of the onsite commissioning support, due to troubleshooting, finding, and correcting problems created by the Customer's installation shall not be the responsibility of SEL ES.

SEL ES engineers will bring hard hat, safety-toe protective footwear, safety glasses, ear plugs, and cotton or fire-rated shirt. Customer will provide any other special clothing or safety equipment required to enter site. Also, Customer will provide any special safety training to enter site (training time shall apply to onsite support time).

SEL ES safety work practices require employee exposure to arc-flash energy be limited to 8 cal/cm². Electrical outages in equipment should be considered as a means to eliminate any risk of employee exposure to arc-flash incident energy. If the normal incident energy is above 8 cal/cm², SEL ES will work with the Customer to evaluate the options to reduce fault current and fault current clearing times, including creating temporary settings changes to speed up protection, opening tie breakers, and other incident energy reduction techniques. If an arc-flash study is required to determine the correct incident energy level, SEL ES will provide a proposal to do this work under a separate contract.

3.5 Cybersecurity – Project Passwords

To maintain security during the processes of engineering, fabrication, factory tests, shipment, delivery, onsite testing, and commissioning, the electronic devices in this system are assigned project passwords. They are specific to this project and are controlled at SEL ES on a strict need-to-know basis.

As part of the final deliverables from SEL ES, the Customer will receive documentation identifying the project passwords in each of the delivered products. SEL ES recommends that the Customer change the project passwords to Customer-defined passwords upon receipt of their products.

SEL ES policy is to change passwords; however, SEL ES will follow the Customer policy regarding passwords as advised.

4 Project Quality Plan

SEL maintains a documented quality system that meets the requirements of ISO 9001.

SEL ES strives to design, develop, and deliver dependable, quality solutions that exceed Customer expectations by applying the example SEL ES Project Procedure illustrated in Figure 1. The procedure and subordinate work instructions encompass a sequential, phase-gate design process that is tailored to the specific scope of the project. The primary goal is to design in quality from the beginning of the project. Time spent early on to ensure that Customer project requirements and the design basis are correct saves time and effort in later phases for the Customer, the project team, and others involved.

The SEL ES Project Procedure for a typical project has phases for planning, definition, development, testing/validation, commissioning, and close out. Detailed design reviews of requirements and deliverables by competent technical reviewers from SEL ES authorized reviewer lists ensure the quality of deliverables. Testing and validation processes prove the performance of the solution for the Customer’s application.

The Customer has an important role in the process. Throughout the project, SEL ES will communicate project status and provide opportunities to define requirements, review deliverables, and provide feedback on SEL ES performance. Additionally, when Customers define hold/witness points or approval requirements, SEL ES will include the requirements in its detailed project plans to guarantee compliance.

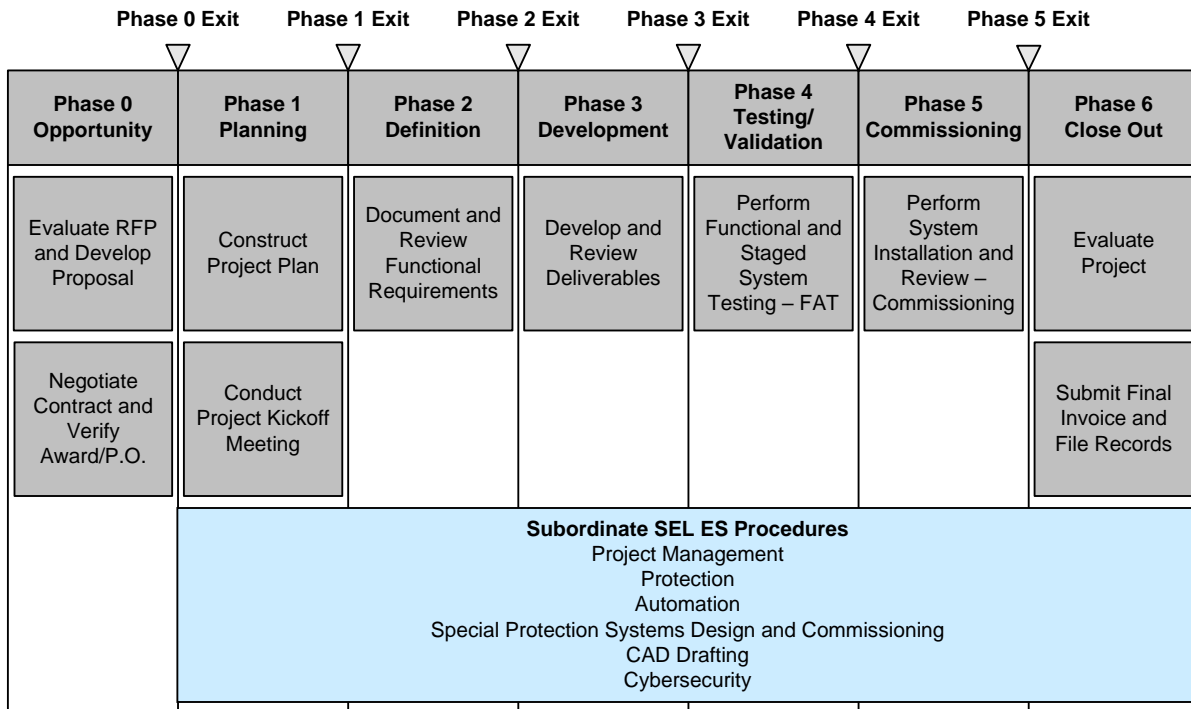


Figure 1: Example SEL ES Project Procedure Diagram

5 SEL ES Terms and Conditions

To accept this proposal and attached terms, please return this sheet, signed and dated. All purchase orders shall be issued to **SEL Engineering Services, Inc.**

San Marcos Electric Utility (“Customer”)
1040 Highway 123
San Marcos, TX 78666
USA

SEL Engineering Services, Inc. (“SEL ES”)
5850 Rogerdale Rd. #150
Houston, TX 77042
USA

Signature: _____

Signature: _____

Print Name: _____

Print Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

Contract Information (to be completed by client):

Contract Amount: \$ _____

Client PO/
Reference/Contract#: _____

Ship To Address: _____

Bill To Street Address: _____

Bill To Email Address: _____

1. Applicable Terms and Conditions. These terms and conditions (“Terms”) and the SEL Proposal constitute the entire agreement between Customer and SEL Engineering Services, Inc. (“SEL”) with respect to the Project. “Project” means the project described in the attached Proposal. These Terms supersede any prior or contemporaneous, verbal or written, agreements, negotiations, commitments, representations or correspondence between the parties, including any terms and conditions on any purchase order form. All sales are expressly limited to these Terms and are conditional on Customer’s assent to these Terms. SEL hereby expressly rejects any representation, express or implied warranty, course of performance or dealing, trade usage or any different or additional terms and conditions not set forth herein unless expressly agreed to in writing and signed by an authorized officer of SEL. Any Schweitzer Engineering Laboratories, Inc. (“SEL, Inc.”) products purchased in conjunction with the Project shall be subject to the then-current SEL, Inc. product sales terms, which are available at SEL’s website at www.selinc.com/termsandconditions/unitedstates and incorporated herein by reference. Training provided by SEL University is governed by the SEL University Terms and Conditions posted on SEL’s website at www.selinc.com/termsandconditions/seluniversity/.

2. SEL Responsibilities. SEL shall furnish the necessary engineers and technicians to provide the engineering services set forth in the Scope of Services. The professional obligations of SEL’s design professionals shall be undertaken and performed in the interest and on behalf of SEL in accordance with applicable laws and regulations governing such design professionals and generally accepted engineering practices prevailing in the jurisdiction where the Project is located. Nothing contained in these Terms shall create any professional obligation or contractual relationship between the individual professionals and Customer. SEL shall assist Customer in obtaining any necessary approvals of professionally-sealed drawings, and shall assist Customer in obtaining necessary approvals from governmental authorities having jurisdiction over the Project.

3. Customer Responsibilities. Customer shall provide SEL with full information regarding the requirements for the Project, and SEL shall be entitled to rely on such information. Any tests, data of any kind or reports of Customer’s other consultants or independent contractors shall be furnished with reasonable promptness and SEL shall be entitled to rely upon their sufficiency, accuracy and completeness without further inquiry. Customer shall provide all information requested by SEL relating to the Project expeditiously and shall render decisions pertaining thereto in order to avoid delay in the orderly progress of the design and construction of the Project. Failure to comply with this requirement may result in additional costs and delays, which shall be Customer’s sole responsibility. Customer will ensure that SEL’s personnel or representatives are provided a safe and secure work environment at all times while they are on site to enable work to be carried out. SEL may, in addition to other rights or remedies available to it, evacuate some or all of its personnel from the site, suspend performance, and/or remotely perform or supervise work. Any such occurrence shall be considered an excusable event. Customer shall reasonably assist in any such evacuation.

4. Changes and Delays. Changes in scope or modification of Services will result in the contract amount and schedule being equitably adjusted. SEL is not obligated to proceed with any change until both parties agree upon such change in writing. SEL shall be entitled to an equitable adjustment in the price and schedule in the event of any changes in the law or engineering standards impacting SEL's obligations or performance under this Agreement. Any order delayed at Customer's request shall be subject to the prices and Terms in effect at the time of release of such delay. Any such order delayed beyond a reasonable period (as determined in SEL's sole discretion) shall be treated as a Customer termination, and Customer shall be responsible for payment of all outstanding invoices, any actual costs incurred up to the date of termination and a 20% cancellation fee on the remaining unbilled balance. When Products are ready for shipment and shipment cannot be made due to Customer's request, SEL shall submit an invoice for such Products payable upon receipt thereof and shall store such Products on Customer's behalf. In such event, risk of loss shall pass to Customer upon moving such Products to storage, and all expenses incurred by SEL in connection with such storage, including without limitation demurrage, cost of preparation for storage, storage charges, insurance (if SEL chooses, at its sole discretion, to purchase such insurance) and handling charges, shall be payable by Customer upon submission of invoices by SEL.

5. Prices, Taxes and Payment Terms. Customer must meet the then-current SEL credit requirements to purchase on credit. Customer shall pay SEL in accordance with the agreed upon Proposal. Payments terms are net thirty (30) days from date of invoice if credit is approved. All invoices shall be deemed accurate unless Customer advises SEL in writing of an error within 10 days following receipt. If Customer advises SEL of an error, (i) any amounts corrected by SEL shall be paid within 14 days of correction or within 30 days of the original invoice date, whichever is later, and (ii) all other amounts shall be paid by Customer by the original due date. If Customer requires SEL to use a specific system or tool to process regular business transactions (e.g. invoices, shipment notifications, purchase orders), SEL may charge Customer for any transaction, setup or subscription fees charged to use the system or tool. SEL may suspend work or cancel any outstanding order if Customer fails to make a payment when due and until such payment is made and may impose a late charge of 1.5% per month or the highest applicable rate allowed by law on all amounts not paid when due. SEL shall not be liable for any liquidated damages if SEL suspends work due to the Customer's late payment or credit issues. If an order is cancelled because of credit issues or late payments, SEL shall be entitled to receive payment of all outstanding invoices, any actual costs incurred to date, and a 20% cancellation fee on the remaining unbilled balance ("Cancellation Charges"). Prices are exclusive of any taxes. If Customer claims a tax or other exemption or direct payment permit, Customer will provide a valid exemption certificate or permit and will indemnify, defend and hold SEL harmless from any taxes, costs and penalties arising from the same. Any payment made by Customer may be applied to amounts due before being applied to current orders, at SEL's sole discretion. Notwithstanding the foregoing, Customer's failure to pay amounts due shall be deemed a material breach of these Terms, and any acceptance by SEL of late payments shall not be deemed a waiver of such breach. To the extent allowed by law, SEL shall be entitled to recover all costs incurred in collecting amounts due from Customer, including without limitation legal fees and other costs (including without limitation disbursements).

6. Intellectual Property. SEL retains all its intellectual property rights. All documents, designs, drawings, plans, specifications and other work product (collectively "Work Product") prepared by SEL in performing the Project shall not be deemed "works made for hire" for Customer. To the extent that any such Work Product prepared by SEL while performing the Project is integrated into the Project, SEL hereby grants Customer a perpetual, worldwide, non-exclusive, non-transferable, personal, revocable, limited license to use, copy and modify such Work Product for internal business purposes only. SEL's Work Product and/or designs for other projects shall not be used for any purpose except the applicable Project without first obtaining SEL's written consent. Customer agrees to indemnify, defend and hold harmless SEL and all related parties from and against any unauthorized use or reuse of Work Product furnished by SEL, and any changes made by Customer or others relating to design documents produced by SEL.

7. Use of Confidential Information. In the performance of the Project and/or these Terms, a party may receive documents, materials, data and other confidential information of the other party or its affiliates. The receiving party shall use confidential information solely in performance of the Project and any resulting business transaction between the parties. The receiving party shall use at least the same degree of care (and, in any event, not less than a reasonable degree of care) in protecting the disclosing party's confidential information as it exercises in protecting its own similar confidential information. Confidential information shall be subject to these Terms for three (3) years following receipt of such confidential information. Confidentiality obligations shall survive the termination of these Terms.

8. Warranties and Limitation of Liability. SEL shall perform the Project in a manner consistent with the degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances. SEL shall reperform (or, at SEL's option, pay a third party to reperform) any defective services at no cost upon receipt of notice detailing the defect(s) within one (1) year of performance of the original services. TO THE MAXIMUM EXTENT PERMITTED BY LAW, THIS WARRANTY SHALL BE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER STATUTORY, EXPRESS, VERBAL OR IMPLIED (INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE AND WARRANTIES ARISING FROM COURSE OF DEALING OR PERFORMANCE OR USAGE OF TRADE). In no event, whether as a result of breach of contract, indemnity, warranty, tort (including negligence), strict liability or otherwise, shall SEL liability to Customer or its insurers for any (i) loss or damage exceed the contract price or (ii) if Customer places multiple order(s) under the contract, the price of each particular order for all claims arising from or related to that order, and any liability shall terminate at a reasonable time, not to exceed one (1) year, after provision of services. No claim, regardless of form, arising from these Terms may be brought more than one (1) year from the date such claim accrues. Claims against SEL are hereby agreed to have accrued not later than the completion of the Project, notwithstanding any laws to the contrary. In no event, whether as a result of breach of contract, indemnity, warranty, tort (including negligence), strict liability or otherwise, shall SEL be liable for any special, incidental, consequential or punitive damages, including without limitation any loss of profit or revenues, loss of use of associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, downtime costs or claims of Customer's customers for such damages. Customer shall indemnify, defend and hold harmless SEL and all related parties from and against any claims, demands, causes of action, losses, costs and expenses, including without limitation legal fees and other costs, arising directly or indirectly from, as a result of or in connection with the acts or omissions of Customer, its officers, employees, agents or representatives, relating to the Project and/or these Terms, including without limitation any defect or failure or alleged defect or failure in or of any Customer product or operation. Remedies are limited to those set forth in these Terms.

9. Termination. Customer may terminate these Terms upon ten (10) business days written notice to SEL in the event the Project is abandoned or otherwise terminated prior to completion. If such termination occurs, Customer shall pay SEL for Cancellation Charges. Customer may terminate the Project if SEL defaults or persistently fails or neglects to perform services in accordance with these Terms. However, such termination is permitted only

if Customer provides written notice setting forth the default and SEL fails to begin to correct the default within ten (10) business days after receipt of such notice.

10. Dispute Resolution. The laws of the State of Washington, United States of America, excluding conflict of laws principles, shall govern these Terms. Any controversy or claim arising out of or relating to these Terms or the breach thereof shall be settled by binding arbitration administered by the American Arbitration Association in accordance with the Procedures for Large, Complex Commercial Disputes under the Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator may be entered in any court having jurisdiction thereof. The place of arbitration shall be Seattle, Washington, United States or another location agreed upon by the parties. The language of the arbitration shall be English. The prevailing party to any dispute shall be entitled to recover legal fees and other costs (including without limitation disbursements, collection costs and the allocated cost of in-house counsel).

11. Insurance. SEL shall maintain for its protection the following insurance coverage: (i) Worker's Compensation, Employer's Liability and other statutory insurance required by law with respect to work related injuries or disease of employees of SEL in such form(s) and amount(s) as required by applicable laws; (ii) Automobile Liability insurance with a combined single limit of \$2,000,000 per occurrence, \$4,000,000 annual aggregate; and (iii) Commercial General Liability or Public Liability insurance for bodily injury and property damage with a combined single limit of \$2,000,000 per occurrence, \$4,000,000 annual aggregate. Upon request, SEL will provide a certificate of insurance reflecting such coverage.

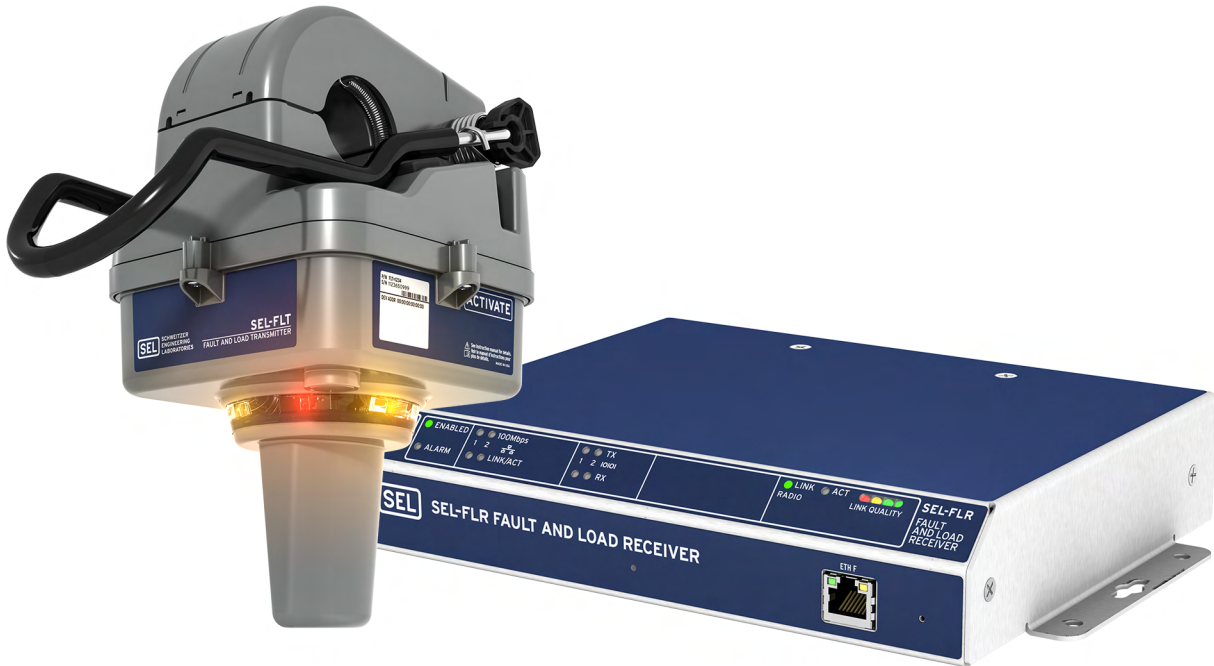
12. Export. Customer acknowledges that all commodities, software or technology (collectively "Items") provided by SEL are subject to US export jurisdiction and agrees to comply with all applicable import and export laws, rules and regulations regarding the transfer of any such Items, including but not limited to, the US Export Administration Regulations 15 C.F.R. Parts 730-774. Customer shall obtain prior authorization from the U.S. Department of Commerce or any other applicable government entities prior to the export, re-export, transfer, diversion or disclosure any Items provided hereunder, or any direct product thereof, to any destination, end-use or end-user which is restricted or prohibited by US or other applicable laws. Customer also agrees to comply with US anti-boycott laws and regulations when exporting Items.

13. Miscellaneous. Any notice pursuant to these Terms shall be deemed given when sent by registered mail, certified mail (return receipt requested), or overnight delivery to an authorized officer at the address listed on the SEL sales order acknowledgment or, if no such address is provided, at the registered headquarters of the other party, or when faxed to 1-509-336-7920 or emailed to legal@selinc.com (receipt confirmed). All rights and duties hereunder shall be for the sole and exclusive benefit of Customer and SEL and not for the benefit of any other party. The assignment or transfer by Customer of any rights or duties hereunder without prior written consent of an authorized officer of SEL shall not relieve Customer of any obligations to SEL. SEL may perform its obligations hereunder personally or through one or more of its affiliates, although SEL shall nonetheless be solely responsible for the performance of its affiliates. SEL may assign or novate its rights and obligations under the Contract, in whole or in part, to any of its affiliates or may assign accounts receivable to any party without Customer's consent. Customer agrees to execute any documents necessary to complete Seller's assignment or novation. SEL may subcontract portions of the work so long as SEL remains responsible for the work. Customer shall notify SEL immediately upon any change in ownership of more than fifty percent (50%) of Customer's voting rights or of any controlling interest in Customer. No failure or delay by either party in exercising any right or remedy, or insisting upon strict compliance by the other party with any obligation in these Terms, shall constitute a waiver of any right thereafter to demand exact compliance with these Terms. The invalidity, in whole or in part, of any provision in these Terms shall not affect the remainder of such provision or any other provision and, where possible, shall be replaced by a valid provision that effects as close as possible the intent of the invalid provision. No party shall be liable for failure to perform or delay in performance of any obligation under these Terms (except payments of amounts already due and owing) where such failure or delay results from any events beyond its reasonable control.

6 Attachment 1: SEL-FLT/SEL-FLR System Deployment Guide



SEL-FLT/SEL-FLR System Deployment Guide



Getting Started

The SEL-FLT/SEL-FLR Fault and Load Transmitter and Receiver System provides fault detection and accurate load data to a centralized location. Refer to the SEL-FLT/SEL-FLR instruction manual for additional details on settings, operation, and specifications. This guide provides a high-level overview of the setup and deployment of the SEL-FLT/SEL-FLR system. To ensure a successful deployment of the SEL-FLT/SEL-FLR system, careful planning is required prior to installation and commissioning of units in the field. If this is your first time deploying the SEL-FLT/SEL-FLR system, SEL recommends starting with a small pilot installation of 2–5 SEL-FLT installation sites before attempting to move forward with a large-scale system deployment. The steps outlined in this guide can be applied to both small and large SEL-FLT/SEL-FLR system deployments.

System Planning

The system planning phase is key to ensuring a successful deployment of the SEL-FLT/SEL-FLR system. This phase should begin before any equipment is ordered. The planning phase includes identification of potential installation locations for the SEL-FLT and SEL-FLR and qualification of communication links to aid in selection of final installation locations. Communication link qualification is vital to the success of a deployment. The effective range for a given application

depends on the terrain, installation locations, SEL-FLR antenna gain and height, and a number of other factors, as shown in *Figure 1*. Achieve the best performance by following the steps in this guide.

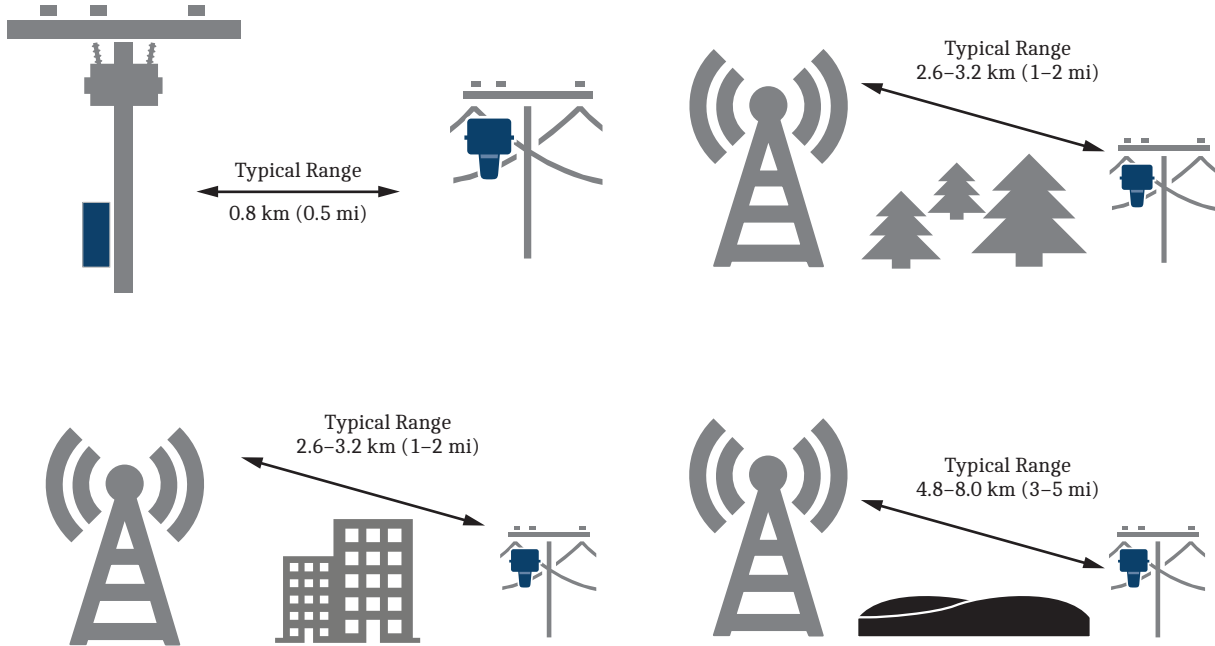


Figure 1 Typical SEL-FLT/SEL-FLR Range for Example Applications

Network Installation Types

The SEL-FLT/SEL-FLR network deployment can be classified as one of two types for any given application: short-range or wide-area.

Short-range applications involve connecting a limited number of SEL-FLT devices to each SEL-FLR where all connected SEL-FLT devices are clearly visible from the SEL-FLR site. This type of installation typically has the SEL-FLR mounted in an enclosure on a distribution power pole with the SEL-FLR antenna on the same pole, and the SEL-FLT devices mounted on the phase conductors in the immediate vicinity of the SEL-FLR. This application provides limited communication range, but it requires less planning, analysis, and communication link qualification to implement.

Wide-area applications involve deployment of SEL-FLT devices over a large area with SEL-FLR devices deployed to provide overlapping coverage for all SEL-FLT sites. The antennas for the SEL-FLR devices in a wide-area application are typically mounted 100 ft or more above the average terrain level to avoid ground cover and provide a direct line of sight to connected SEL-FLT devices. Mounting the SEL-FLR antenna at a high point such as a radio communications tower allows the SEL-FLR to communicate in a large radius with SEL-FLT devices. This application requires careful planning and communication link qualification for each SEL-FLT and SEL-FLR location to ensure reliable network operation.

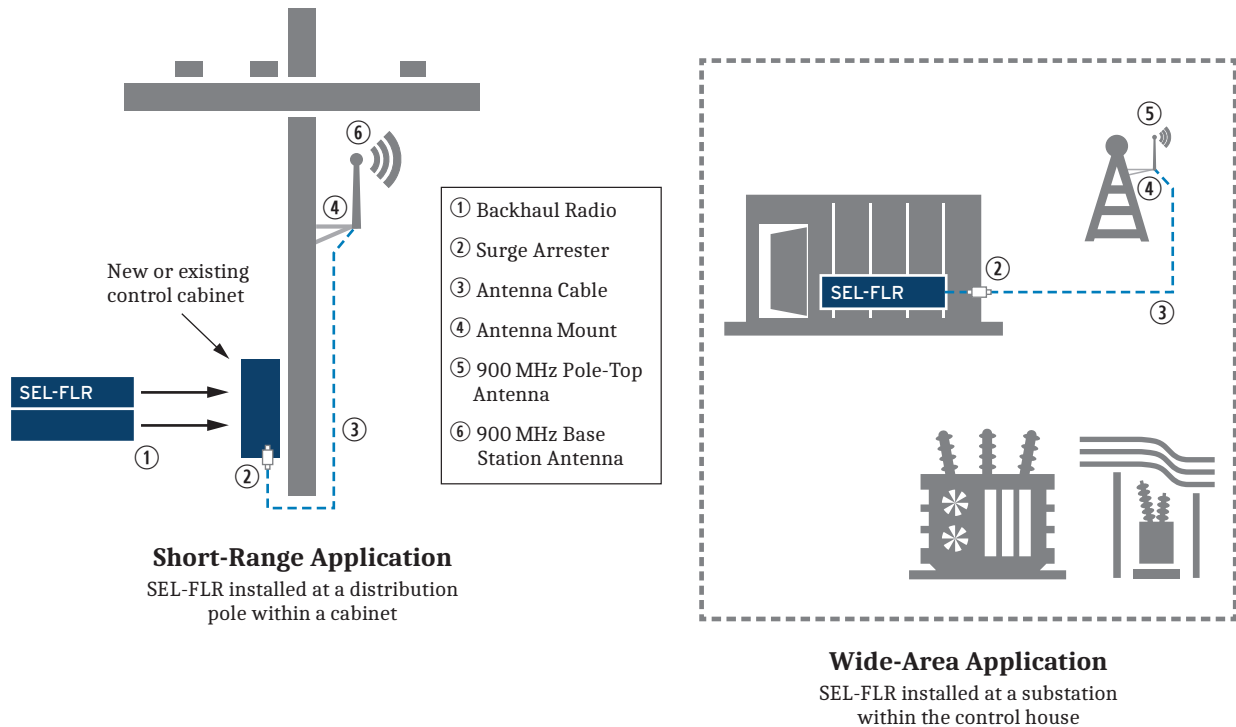


Figure 2 Typical Installation Locations for the SEL-FLR

It is not uncommon for a deployment to include a combination of short-range and wide-area applications of the SEL-FLT/SEL-FLR system in order to achieve reliable communications at each installation site. *Figure 1* provides some general guidance on typical communication range for different application types and terrains that can be useful when selecting potential SEL-FLT/SEL-FLR installation sites.

Identify SEL-FLT Installation Sites

The first step in planning an installation of SEL-FLT/SEL-FLR system is to choose desired installation sites for the SEL-FLT devices. The SEL-FLT can be used on overhead bare or covered conductors (unshielded) on distribution circuits with system voltages as high as 69 kV (L-L). The SEL-FLT harvests energy and is powered by a 3.5 A minimum continuous load current flowing through the power line. It weighs 1.63 kg (3.6 lb) and accommodates conductors from 6.4 to 38.1 mm (0.25 to 1.50 in) diameter. This allows the SEL-FLT to be applied at a wide range of locations throughout power distribution systems to provide fault location and load measurements. The SEL-FLT should not be installed at locations where load current may drop below 4 A during normal system conditions. The GPS coordinates and approximate line height (above ground) should be recorded for each desired SEL-FLT installation site. For wide-area applications, it is useful to identify potential alternative installation locations at each site in case a reliable communication link cannot be achieved with the initial location due to obstructions that block line of sight.

Identify SEL-FLR Installation Sites

The SEL-FLR is a powerful device that is a sensor data collector, pollable DNP device, and sensor management tool. The SEL-FLR contains a built-in web interface for viewing and managing its settings and the settings of connected SEL-FLT devices. The SEL-FLR requires a 12–24 Vdc power source to operate,

which must be considered when identifying potential installation sites. The SEL-FLR also requires a weatherproof enclosure to reduce its exposure to water, dust, and moisture. It is rated to the temperatures of outdoor environments but is an indoor device fully suited for installation within an outdoor equipment cabinet, such as a recloser control cabinet. A communication backhaul must be provided for DNP3 communications from the SEL-FLR to SCADA. When identifying potential SEL-FLR sites, the following items must be considered:

- Enclosure or structure in which the SEL-FLR will be mounted
- Communication backhaul from SEL-FLR to SCADA
- Availability of 12–24 Vdc power for SEL-FLR
- Ride-through capability of 12–24 Vdc power supply during an outage
- Mounting location and height of antenna connected to SEL-FLR
- Proximity to existing 900 MHz radio antennas

Prioritizing potential SEL-FLR installation sites based on the availability of existing enclosures, communication towers, and communication backhaul to SCADA can help with selection of initial sites. Subsequent sections provide additional consideration details for each type of installation.

Short-Range Application

When identifying potential SEL-FLR locations for short-range applications, it is typical to start with locations that have existing enclosures with available power and antenna mounting options. If the proposed SEL-FLR installation sites are not clearly visible from the existing enclosure location, other enclosure sites for the SEL-FLR should be evaluated.

For pole-mounted applications, it may be necessary to add a battery or other form of backup power. A backup power supply ensures that the SEL-FLR operates during an outage for long enough to send all pertinent information back to SCADA. Communication backhaul from the SEL-FLR installation site is required to send DNP3 data to SCADA. Cellular backhaul can easily be added to these locations by using the SEL-3061 Cellular Router. Communication over fiber or other wireless backhaul solutions that support DNP3 traffic over Ethernet can be used to connect the SEL-FLR to SCADA.

When you use a backhaul radio, you must take into consideration the backup power requirements of the SEL-FLR and the backhaul radio.

Wide-Area Application

When identifying potential SEL-FLR locations for wide-area applications, it is typical to start with locations where there is an existing tall structure (communications tower, water tower, etc.) upon which the SEL-FLR antenna can be mounted. Structures that are well above average terrain and ground cover (trees, buildings, other vegetation, etc.) provide the best chance of coverage over a wide area and have the added benefit of a communication backhaul likely being already available at these locations. As with the short-range application, a communication backhaul from the SEL-FLR to SCADA is required and can be achieved using a variety of communication solutions.

When setting up a sensor network over a large area, it is important to identify multiple potential SEL-FLR locations to provide the best chance of achieving wireless coverage for all SEL-FLR sites. Unless the terrain in the area where the sensor network is being installed is relatively flat and the average ground cover is below line height where the SEL-FLR devices will be installed, it is unlikely that

a single SEL-FLR location can provide adequate wireless coverage to all desired SEL-FLT sites. Short-range SEL-FLR installations can be used to fill in coverage gaps in wide-area network applications.

The GPS coordinates and approximate antenna mounting height should be recorded for each potential SEL-FLR installation site identified.

Qualify Communication Links

Once potential installation sites have been identified for the SEL-FLT and SEL-FLR devices, qualification of communication links between these sites must be completed to ensure reliable communication among these devices upon deployment. Communication qualification is a critical part in the system planning phase. Failure to complete this process may result in intermittent or unavailable communication to one or more SEL-FLT sites.

The steps required for communication qualification differ for short-range and wide-area applications. Subsequent sections provide recommended communication qualification steps for short-range and wide-area applications.

Short-Range Applications

Minimal communication qualification is required for short-range applications. A simple site survey is sufficient in most cases. A site survey is used to verify SEL-FLT sites are clearly visible from the SEL-FLR antenna. The survey involves a visual inspection of the installation sites of the SEL-FLT and SEL-FLR devices and the path between these sites. A site survey can identify obstructions in the signal path for short-range applications. For pole-mounted antennas, if you can see all the candidate SEL-FLT locations while standing on the ground beside the pole, or while safely looking from the equivalent antenna height, the system is viable.

If an obstruction does exist, determine if the SEL-FLR antenna can be better positioned to avoid the obstruction or identify if alternative SEL-FLT or SEL-FLR installation locations would provide better results. SEL also recommends measuring the local interference from other 900 MHz equipment as part of the site survey. Refer to *Onsite Testing Procedure* on page 7 for details on how to perform a channel analysis scan by using the SEL-FLR to measure local 900 MHz interference.

Wide-Area Applications

Wide-area applications require more rigorous communication qualification to verify if proposed SEL-FLT and SEL-FLR installation sites will result in reliable communication links. The communication qualification process for wide-area applications typically includes a link budget analysis, area study, path studies, and onsite testing. Subsequent sections provide additional information on each of these steps.

Link Budget Analysis

A high-level link budget analysis is a useful tool for performing a rough estimate of link performance in an area and identifying application installation parameters for further analysis. As part of the link budget analysis, it is necessary to determine the gain of the antenna that will be used at each proposed SEL-FLR installation site. *Appendix A: SEL-FLR Antenna Selection Guidelines* on page 10 provides guidance on antenna selection for use with the SEL-FLR.

When performing the link budget analysis, it is important to estimate the level of interference from 900 MHz communication equipment in the area. The magnitude of this interference can have a significant impact on the effective range of potential SEL-FLT/SEL-FLR communication links. If possible, measure the level of interference at potential installation sites to complete the link budget analysis. *Onsite Testing Procedure* on page 7 provides detailed instructions for using the SEL-FLR to perform a channel analysis scan. *Appendix D: Link Budget Analysis* in the SEL-FLT/SEL-FLR instruction manual provides guidance on performing a link budget analysis along with worked examples. When using channel scan data from the SEL-FLR with these instructions, use the measured Average Interference RSSI as the Effective RX Sensitivity.

Area Study

Area studies provide an approximation of the expected receive power levels in the area around an SEL-FLR site. These studies combine the RF characteristics of the system (e.g., system TX power, cabling losses, antenna gain) and local geography and ground cover to determine expected receive power levels in the area around each proposed SEL-FLR installation site. Area studies provide a first pass for site qualification and are useful when there are multiple potential SEL-FLT sites in a given area. However, area study results are only an estimate and should not be used as a coverage map. Area study results should be used to verify potential SEL-FLT sites that are candidates for onsite testing. In the example area study shown in *Figure 3*, potential SEL-FLT installation sites in the green areas would be recommended for onsite testing. For potential locations outside this area, further planning and the assessment of additional SEL-FLR installation sites would be recommended prior to performing onsite testing.

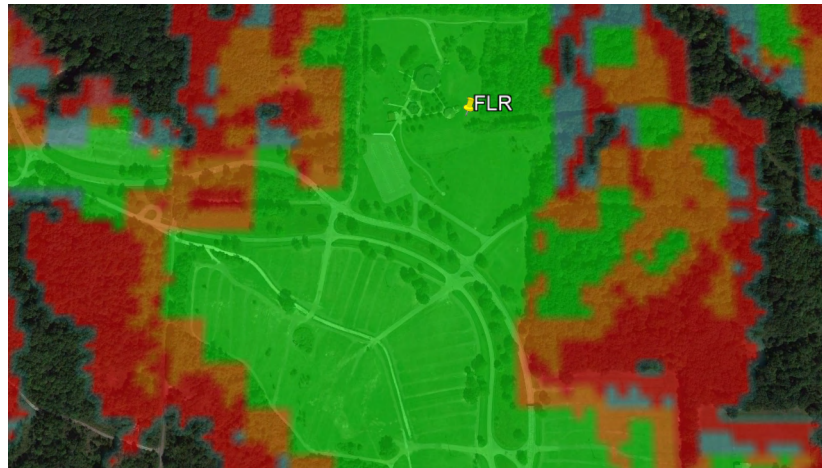


Figure 3 Example SEL Area Study

Path Study

A radio propagation or path study evaluates the communication path between two points. This study provides the estimated receive signal strength at each end of the path based on the transmit power, path loss, obstructions, and antenna gain. Path studies provide more accurate results for a given path than area studies and are a good option for pilot installations and other applications where there are a small number of installation sites. However, as with area studies, path study results do not guarantee that a reliable communication link can be achieved in the field for a proposed application.

Onsite testing is necessary to confirm path study results and determine the impact of any local interference from other 900 MHz equipment. SEL provides radio path studies for as many as five SEL-FLT links at no cost. For larger studies, SEL offers this service for a fee through SEL Engineering Services, Inc. (contact SEL for details). Only one path study is needed for each group of co-located SEL-FLT devices.

Onsite Testing

For wide-area applications, onsite testing is required to assess the viability of communication links between proposed SEL-FLT and SEL-FLR installations. Even in cases where area and path studies are completed, onsite testing is required to verify study results and determine actual link quality in the field. In cases where units are installed without conducting onsite testing, it is likely that one or more of SEL-FLT installation sites will not be able to achieve a reliable link and that SEL-FLT devices at these sites will need to be moved or other SEL-FLR installation sites added.

Onsite Testing Procedure

The following equipment is required prior to beginning onsite testing:

- Minimum of one SEL-FLR
- Minimum of one SEL-FLT
- Antenna(s) for SEL-FLR and associated antenna cable and accessories

All testing should be conducted with SEL-FLT devices and the SEL-FLR connected antennas at or close to the intended height above ground level for the planned installation. To ensure conservative results, SEL recommends conducting onsite testing in the spring or summer where possible to confirm RSSI with the maximum obstruction from vegetation.

Short-Range Applications

In most cases, testing for short-range applications should not require any equipment installation. Begin testing by performing channel analysis scans as described in the following section for wide-area application testing. It is still important to use the same type of antenna for testing that is intended for use in the actual installation. If the average interference RSSI is less than -65 dBm, confirm that the proposed SEL-FLT installation location is physically visible from the proposed SEL-FLR antenna installation location. Applications that meet these criteria result in a high-quality wireless link. If the average interference RSSI exceeds -65 dBm, SEL recommends performing the full testing procedure outlined for wide-area applications. For short-range applications where the SEL-FLT devices are on the line directly above or very close to the SEL-FLR installation location, onsite testing is not required.

Wide-Area Applications

Onsite testing is required for all wide-area applications. Line of sight is critical for 900 MHz communication and it is thus important to ensure that testing is performed with the SEL-FLR antenna and the SEL-FLT devices at the same height above ground level at which they will be installed. It is also important to conduct onsite testing with the same type of antenna for the SEL-FLR that will be installed in the final application. In most cases, these requirements necessitate that SEL-FLR devices be installed prior to beginning onsite testing.

Perform a Channel Analysis Scan

The first step is to perform a channel analysis scan at the proposed SEL-FLR site. The SEL-FLR and SEL-FLT communicate on 1 of 25 non-overlapping channels in the license-free 900 MHz industrial, scientific, and medical (ISM) band. Prior to testing the link between the SEL-FLR and an SEL-FLT, first select a communication channel for the SEL-FLR at the test site. To determine the best channel for minimizing local RF interference from other 900 MHz equipment, use the SEL-FLR site analysis tool available in the SEL-FLR web interface to perform a minimum of five channels scans. *Figure 4* shows an example of the **Channel Analysis** screen including scan results. Keep a record of each channel analysis scan to provide a reference of interference observed during the testing procedure. Pasting screen shots into a document provides an easy way to keep track and compare results.

Channel Analysis

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Channel	Average	Peak
1	-86 dBm	-73 dBm
2	-77 dBm	-43 dBm
3	-78 dBm	-44 dBm
4	-85 dBm	-80 dBm
5	-82 dBm	-52 dBm
6	-84 dBm	-75 dBm
7	-84 dBm	-80 dBm
8	-83 dBm	-79 dBm
9	-83 dBm	-77 dBm
10	-80 dBm	-75 dBm
11	-81 dBm	-70 dBm
12	-81 dBm	-76 dBm
13	-80 dBm	-66 dBm
14	-79 dBm	-71 dBm
15	-78 dBm	-73 dBm
16	-79 dBm	-73 dBm
17	-77 dBm	-73 dBm
18	-77 dBm	-72 dBm
19	-75 dBm	-68 dBm
20	-75 dBm	-71 dBm
21	-72 dBm	-47 dBm
22	-76 dBm	-71 dBm
23	-75 dBm	-70 dBm
24	-76 dBm	-73 dBm
25	-76 dBm	-67 dBm

Figure 4 SEL-FLR Channel Analysis Scan Results

After completing a minimum of five scans, average the results of the recorded Average RSSI for each channel. Select the channel with the lowest overall Average RSSI value (e.g., -90 is lower than -70). In cases where there are multiple channels with similar Average RSSI, select the channel with the highest Peak RSSI (a high peak to average power ratio means the duty cycle of the interferer is lower). These RSSI values provide a measure of the amount of interference on each channel at the time of the scan. *Figure 5* provides general guidelines on

channel interference measured at the SEL-FLR. When installing two or more SEL-FLR devices in proximity such that there may be overlapping coverage, ensure that at least two unused channels separate each selected SEL-FLR channel. Refer to the SEL-FLT/SEL-FLR instruction manual for further details.

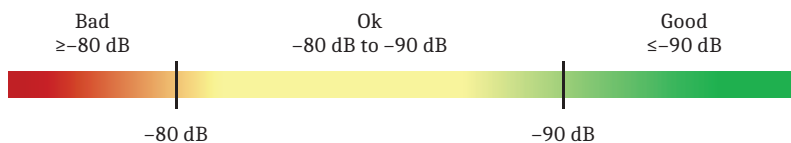


Figure 5 SEL-FLR Channel Interference

Measure RSSI for Test SEL-FLT

Once you have selected the SEL-FLR channel, perform the following procedures for each potential SEL-FLT installation site planned for communication with that SEL-FLR. This procedure verifies radio link performance between the SEL-FLT and SEL-FLR. Use a magnet tool to activate the SEL-FLT used for the test and raise it to line height at the test site. You may choose to install the SEL-FLT on the power line or simply bring the SEL-FLT to line height at a safe distance away from the power line. Once the SEL-FLT appears in the discovery list, record its RSSI value and then clear the discovery list.

For tests involving a small number of SEL-FLT sites, the additional step of adding the SEL-FLT to the whitelist and attempting to join the SEL-FLR network can be taken where time permits. To expedite this process, deactivate and then reactivate the SEL-FLT radio once it has been added to the SEL-FLR whitelist. This restarts the network join process for the SEL-FLT and helps avoid the 15-minute back-off delay between join attempts. It can take several minutes for the SEL-FLT to join the SEL-FLR network and report the RSSI.

Evaluate Test Results

Upon gathering measurements from each test site, compare recorded values to evaluate the link quality for each test site. Complete the evaluation by using the measured SEL-FLT link RSSI recorded from the discovery list and the average interference level RSSI recorded during the initial channel analysis scans to determine the link margin according to *Equation 1*.

$$\text{Link Margin} = \text{SEL-FLT RSSI} - \text{Average Interference RSSI}$$

Equation 1

A link margin greater than +10 dB results in a reliable wireless link between the proposed SEL-FLR and SEL-FLT sites tested. A link margin less than +10 dB may result in a marginal link or indicate that the wireless communication link is not viable. For locations with a link margin less than +10 dB, SEL recommends returning to the planning phase to evaluate additional potential SEL-FLT and SEL-FLR installation sites for evaluation based on prioritization of installation. In most cases, additional SEL-FLR sites will be required to establish a reliable communication link with SEL-FLT sites that failed initial link margin tests. In some cases, different SEL-FLT installation sites may be selected to increase the likelihood of establishing a reliable communication link with the SEL-FLR test site(s).

Onsite testing, which should be used in selection of additional proposed sites for evaluation, helps provide a deeper understanding of the typical effective range of the SEL-FLT/SEL-FLR system for your specific area and application. Any necessary additional sites should be selected and qualified according to the instructions in this guide.

Appendix A: SEL-FLR Antenna Selection Guidelines

⚠ CAUTION

The SEL-FLR antenna should not be mounted on the same pole as antennas for other 900 MHz communication equipment.

Omnidirectional antennas are typically used for most SEL-FLR installations. However, in cases where all SEL-FLT devices are in one direction from the SEL-FLR, it may be possible to use a yagi antenna to achieve additional gain. It is possible to use antennas not provided by SEL for SEL-FLR installations provided that the antenna is designed for operation in the 902–928 MHz band and is not greater than the maximum allowed gain of 9.15 dBi for an omnidirectional antenna or 14.15 dBi for a yagi antenna.

In many cases, you may need to mount the antenna below the neutral conductor for applications where the SEL-FLR is pole-mounted. This will place further constraints on the antenna height and the antenna that can be used. When all of the SEL-FLT devices will be within close proximity to the SEL-FLR for short-range applications, a smaller gain antenna such as the 3 dBi gain omnidirectional antenna may be sufficient. For pole-mounted SEL-FLR installations for wide-area applications or short-range applications when one or more SEL-FLT devices will be farther away than a few spans, SEL recommends using the highest-gain antenna that meets the physical space requirements. *Table 1* shows the physical sizes of example omnidirectional antennas that are compatible with the SEL-FLR.

Table 1 Omnidirectional Antenna Sizes

Antenna Type	SEL Part Number	Description	Length	Omnidirectional Diameter
Omnidirectional	235-0003	Low-profile 3 dBi gain omnidirectional antenna, 698–960 MHz, 1710–2700 MHz, N female connector	90 mm (3.5 in)	37 mm (1.4 in)
	235-0232	7.15 dBi gain omnidirectional antenna, 902–928 MHz, N female connector	1358.9 mm (53.5 in)	33.3 mm (1.3 in)
	235-0233	9.15 dBi gain omnidirectional antenna, 902–928 MHz, N female connector	2476.5 mm (97.5 in)	33.3 mm (1.3 in)

Appendix B: SEL-FLT Deployment Tracking Sheet

Project: _____
Name: _____ Circuit: _____
Date: _____ Associated SEL-FLR: _____

Location

Phase A

Phase B

Phase C

Place
Label
Here

Place
Label
Here

Place
Label
Here

Location

Phase A

Phase B

Phase C

Place
Label
Here

Place
Label
Here

Place
Label
Here

Location

Phase A

Phase B

Phase C

Place
Label
Here

Place
Label
Here

Place
Label
Here

Location

Phase A

Phase B

Phase C

Place
Label
Here

Place
Label
Here

Place
Label
Here

Notes: _____

Appendix C: SEL-FLT Flash Pattern Overview

Table 2 Events Display Flash Patterns

Event	LED Color(s)	Duration	Notes
Permanent fault	Red and yellow	Permanent Fault Display Time-out duration (default is 8 hours) or until re-arm	Rotating flash pattern.
Fault stimulus	Red and yellow	T_{FLT} (default is 5 minutes); subsequent flash sequence is determined by fault type	Rotating flash pattern.
Permanent loss of current	Yellow	Display Time-Out duration (default is 8 hours)	Display for this event is disabled by default.
Momentary loss of current	Yellow	Display Time-Out duration (default is 8 hours)	Display for this event is disabled by default.
Momentary fault	Yellow	Display Time-Out duration (default is 8 hours)	Display for this event is disabled by default. The fault stimulus pattern will flash first until T_{FLT} has expired and the event has been identified as a momentary fault.
Disturbance	Yellow	Display Time-Out duration (default is 8 hours)	Display for this event is disabled by default. The fault stimulus pattern will flash first until T_{FLT} has expired and the event has been identified as a disturbance.

Table 3 Magnet Tool Button Press Display Flash Patterns

Short button press:	Hold the magnet tool on the ACTIVATE section until 1 red LED starts to blink (3–5 seconds) and then remove it. This will test the local display and reset it if it is already flashing for an event.		
Event	LED Color(s)	Duration	Notes
Display test	Red and yellow	3 rotating flash pattern sequences (over 30 seconds)	Red and yellow rotating flash pattern followed by yellow rotating flash pattern.
Long button press:	Hold the magnet tool on the ACTIVATE section until 1 yellow LED starts to blink (10–12 seconds) and then remove it. This will activate or deactivate the SEL-FLT.		
Event	LED Color(s)	Duration	Notes
Radio activation	Red	5 seconds	1 red LED flashes for duration.
Radio deactivation	Red	5 seconds	2 alternating red LEDs flash.

Table 4 Device Status Display Flash Patterns

Event	LED Color(s)	Duration	Notes
Armed for fault detection	Yellow	Flashes all three LEDs 20 times	LEDs only flash on rising edge of device arming.
Network Join	Red	Flashes all three LEDs 20 times	LEDs only flash on rising edge of joining an SEL-FLR network.

Technical Support

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

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<p>⚠️ WARNING Operator safety may be impaired if the device is used in a manner not specified by SEL.</p>	<p>⚠️ AVERTISSEMENT La sécurité de l'opérateur peut être compromise si l'appareil est utilisé d'une façon non indiquée par SEL.</p>
<p>⚠️ CAUTION Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.</p>	<p>⚠️ ATTENTION Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.</p>

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